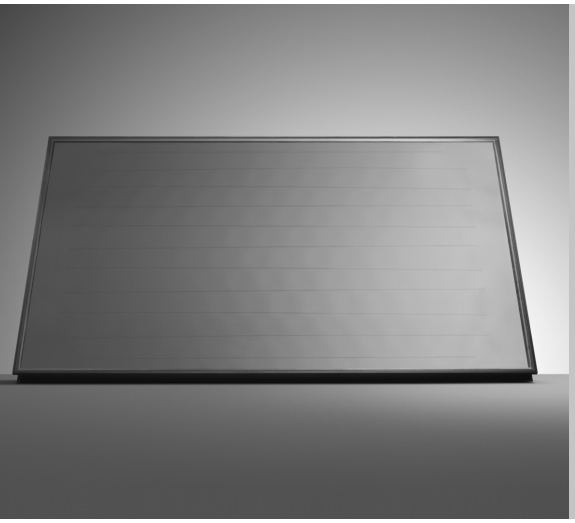
For the heating engineer

Installation manual



auroTHERM

Multi-row in-roof mounting

VFK 145/2 H/V

VFK 155 H/V

GB

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1 Notes on the documentation

The following instructions are intended to guide you throughout the entire documentation.

1.1 Other applicable documents

When assembling the flat collectors, observe all installation instructions for the parts and components in the solar system, as well as the material lists for the installation kits. These documents are included with the individual parts of the installation and ancillary components.
We accept no liability for a damage caused by failure to observe these instructions.

1.2 Storing documents

Please pass on this installation manual and all other applicable documents and auxiliary equipment to the plant operator, whose responsibility it is to ensure the manuals and auxiliary equipment are available whenever required.

1.3 Symbols used

Please observe the safety instructions in this installation manual for the installation of the collector.

Symbol that denotes danger:
- Imminent danger to life
- Risk of severe personal injury
- Risk of slight personal injury

Symbol that denotes danger:
- Risk of death from electric shock

Symbol that denotes danger:
- Risk of material damage
- Risk of damage to the environment

Symbol that denotes useful tips and information

➤ Symbol for a required task

1.4 Applicability of the manual

These installation manual applies exclusively to flat collectors with the following article numbers:

Collector type	Article number
auroTHERM	
VFK 145/2 H	0010004457, 0010008899
VFK 145/2 V	0010004455, 0010008898
auroTHERM plus	
VFK 155 H	0010013174
VFK 155 V	0010013173

Table 1.1 Collector types and article numbers

➤ For the flat collector article number please see the identification plate on the upper collector edge.

Vaillant flat collectors are available in different versions: A variant for the horizontal collector position (VFK H) and a variant for the vertical collector position (VFK V).

The instructions apply to multi-row in-roof mounting of Vaillant flat collectors. In this instance, a collector array is integrated into the roof.

The collectors are arranged on top of and next to one another:
- 2 to 12 collectors next to one another,
- 2 or more collectors on top of one another (depending on roof height).

Furthermore, with the VFK H it is only possible to mount two collectors on top of one another.

Generally, the installation steps and the instructions described in this manual are valid for both collector positions and for all array arrangements.
Any different installation steps are clearly pointed out:

Only for the horizontal collector position

Only for the vertical collector position

Only when two VFK Hs are on top of one another

2 Safety

2.1 Safety and warning information

➤ When assembling the flat collector, take account of the general safety instructions and the warning notes that appear before all of the actions.

2.1.1 Classification of warnings

The following warning signs and signal words are used to classify the warning notices in accordance with the severity of the possible danger.

Warning sign	Signal word	Explanation
	Danger!	Immediate danger to life or danger of severe personal injury
	Danger!	Risk of death from electric shock
	Warning!	Risk of slight personal injury
	Caution!	Risk of material or environmental damage

Table 2.1 Meanings of the warning signs and signal words

2.1.2 Structure of warnings

Warning signs are identified by an upper and lower separating line. and are laid out according to the following basic principle:

Signal word!
Type and source of danger.
Explanation of the type and source of danger
➤ Measures for averting the risk

2.2 Intended use

The Vaillant auroTHERM flat collectors are built and designed according to accepted safety rules and regulations.
Nevertheless, there is still a risk of injury or death to the user or others or of damage to the unit and other property in the event of improper use or use for which it is not intended.
The unit is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and/or knowledge, unless they have been given supervision or instruction concerning use of the unit by a person responsible for their safety.
Children must be supervised to ensure they do not play with the unit.
Vaillant auroTHERM flat collectors are used for heating support and for solar hot water generation.
The flat collectors may only be operated with Vaillant ready-mixed solar fluid. Passing heating water or hot water directly through the flat collectors is not permitted.
Any other use or extended use is considered to be improper. The manufacturer/supplier is not liable for any resulting damage. The user alone bears this risk.
Intended use also includes observance of the installation manual and all other applicable documents, as well as adherence to the maintenance and inspection conditions.

2.3 General safety instructions

➤ Please note the following before and/or during the installation:

Avoid risk of death from falls and falling objects
➤ Observe the national regulations for working at heights.
➤ Wear the Vaillant safety belt.
➤ Cordon off the areas in the fall zone below the working position so that persons cannot be injured by falling objects.
➤ Identify the working position, e.g. by signs conforming to the applicable national regulations.

Avoid danger of burning and scalding
When exposed to solar irradiation, the inside of the collectors can reach 200 °C.
➤ Remove the sun protection film installed at the factory only after the solar energy system has been started up.
➤ Do not perform assembly or maintenance work under direct sunlight.
➤ Cover the flat collectors before starting work.
➤ Preferably work during the morning.

Avoid damage caused by incorrect assembly
In order to install flat collectors according to the installation manual, a qualified engineer is required.
- ➤ The installation should thus be performed only if a qualified engineer is available.
- ➤ Use the fastening systems provided by Vaillant for the flat collectors.
- ➤ Assemble the flat collectors as described in this manual.

Avoid malfunctioning of the system caused by air bubbles
- ➤ To fill the system, use the filling trolley to avoid air bubbles.
- ➤ Use the manual air vent installed on the collector field.
- ➤ Install the Vaillant solar automatic air vent in the highest point of the system or insert the automatic de-aerator in the solar circuit.
- ➤ Observe the relevant installation and operating manual.

2.4 Combination with other components

Vaillant flat collectors should be combined only with Vaillant components (fixing, connections) and system components.
The use of other components or system components shall be considered as improper use. We accept no liability.

2.5 Operational conditions

Danger!
Danger of personal injury and material damage caused by a collapsing roof!
A roof with insufficient load-bearing capacity can collapse as a result of the additional loading caused by the flat collectors.
- ➤ Before installation, check the maximum roof load!
- ➤ Mount the flat collectors only on roofs with a sufficient load-carrying capacity.
- ➤ If necessary, call a technician.

Caution!
Leaks!
With roof pitches < 22° rainwater can collect on the cover plates and leaks can occur.
- ➤ Only install multi-row flat collectors in-roof if the roof pitch is between 22° and 75°.

2.5.1 Maximum wind load

The flat collectors are suitable for a maximum wind load of 1.6 kN/m².

2.5.2 Maximum standard snow load

The flat collectors are suitable for a maximum standard snow load of 5.0 kN/m².

2.5.3 Roof pitches

- ➤ Only install multi-row flat collectors in-roof if the roof pitch is between 22° and 75°.

2.5.4 Edge distances

- ➤ Maintain a distance of at least 1 metre from the edges of the roof and the ridge.
- ➤ Do not fit the collectors on a roof overhang.

2.6 CE label

The CE label states that the units as described in the type overview satisfy the basic requirements of the following directives:
- Directive 97/23/EWG of the European Parliament and Council for harmonization of the laws of the member states regarding pressure equipment.

auroTHERM flat collectors are built according to the state of the art and recognised safety rules and regulations.
Conformity with the applicable standards has been demonstrated.

auroTHERM flat collectors have been successfully tested according to the rules and requirements for the Solar Keymark.

3 Transport and assembly instructions

3.1 Transport and handling instructions

Caution!
Collectors may be damaged by incorrect storage!
If the flat collector is not stored correctly, moisture can penetrate and cause damage in the presence of frost.
➤ Always store the flat collectors in a dry place and protected from the elements.

➤ Always transport the flat collector lying flat to ensure optimum protection.
➤ The load can be transported to the roof more easily using a construction site crane or automatic crane. If this equipment is not available, an inclined hoist can be used. In either case, it is essential to guide the flat collector with additional ropes to prevent swinging or tilting to the side.
➤ If motorised equipment is not available, pull the flat collector on to the roof by sliding them up lean-to ladders or scaffolding boards.

3.2 Installation instructions

➤ Observe the maximum permissible substructure loading and the required distance from the roof edge in accordance with EN 1991.
➤ Attach the flat collectors carefully to ensure that the brackets can safely withstand the tensile loading that occurs during storms and adverse weather conditions.
➤ Align the flat collectors to point south if possible.
➤ Remove the sun protection film on the flat collectors only after the solar energy system has been started up.
➤ For work on the solar circuit, use only hard soldered joints, gaskets and compression fittings or press fittings that have been approved by the manufacturer for use in solar circuits and at correspondingly high temperatures.
➤ Thermally insulate the pipes in accordance with the Heating Systems Ordinance (HeizAnlV), making sure that the thermal insulation is temperature resistant (175 °C) and UV resistant.
➤ Fill the solar system only with Vaillant ready-mixed solar fluid.

3.3 Technical Guidance

The system must be installed in accordance with all relevant and applicable national regulations, and must be installed to suit site conditions.
Observe all national regulations, including:
- Working at Heights Regulations 2005
- Health and Safety at Work Act 1974
- Electricity at Work Regulations 1989
- IEE Wiring Regulations BS 7671
- Lightning protection requirements
- Equipotential bonding of electrical installations.

3.4 Related documents

The installation of the solar system must be in accordance with the relevant requirements of Health and Safety Document No. 635 (The Electricity at Work Regulations 1989), BS7671 (IEE Wiring Regulations) and the Water Supply (Water Fitting) Regulations 1999, or The Water Bylaws 2000 (Scotland). It should also be in accordance with the relevant requirements of the Local Authority, Building Regulations, The Building Regulations (Scotland), The Building Regulations (Northern Ireland) and the relevant recommendations of the following British Standards:
BS EN 806: Specification for installations inside buildings conveying water for human consumption.
BS 6700: Services supplying water for domestic use within buildings and their curtilages.
BS 5449: Forced circulation hot water central heating systems for domestic premises. Note: only up to 45 kW.
BS 6880: Low temperature hot water heating systems of output greater than 45 kW.
Part 1 Fundamental and design considerations.
Part 2 Selection of equipment.
Part 3 Installation, commissioning and maintenance.
BS 6114: Expansion vessels using an internal diaphragm for unvented hot water supply systems.
BS 4814: Specification for: Expansion vessels using an internal diaphragm, for sealed hot water heating systems.
Unvented hot water systems must comply with building regulation G section 3.

3.5 Regulations for the prevention of accidents

When carrying out works such as solar installation work it is necessary to do so in a safe and workman like manner, taking due care of any aspects of the works that could result in injuries to person in or about the building as well as workers, passers by and the general public at large. To that end these works must conform, but not be limited to, the current regulations in force such as the following
Health and Safety at Work act 1974
Work at Height Regulations 2005
Electricity at Work Regulations 1989
All necessary Building Regulations.

Work should be preceded by a risk assessment covering all aspects of health and safety risks, or training requirements that can reasonably be foreseen to be associated with the work. All scaffolding in the UK, other than prefabricated (zip-up) scaffold towers, must be designed and constructed by a vetted contractor, and have suitable kick boards, hand rails and where appropriate netting. Areas around the scaffolding should be zoned off and marked with suitable warning signs to a suitable distance to protect persons from falling objects.
Workers should have available and use personal protective equipment as necessary. This would include equipment such as fall protection systems, safety gloves, goggles, dust masks as well as any specialised equipment that may be in use such as lifting and handling equipment.
The completed works shall comply with all necessary BS EN Standards and Codes of practice as well as Building control or planning requirements and be confirmed where necessary by notification to building control or the appropriate competence based notification body.

- ➤ When fitting the collectors, observe the applicable national regulations for working at the particular height.
- ➤ Provide the mandatory fall protection by using, e.g., roof restraining frameworks or roof protection walls.
- ➤ If a roof restraining framework or a roof protection wall is not appropriate, use safety harnesses such as, e.g., the Vaillant safety belt (not available in all countries) as fall protection.
- ➤ Use gloves to prevent injuries on sharp-edged parts.
- ➤ Only use tools and aids (e.g. lifting gear or lean-to ladders) that conform to the particular applicable accident prevention regulations.

- ➤ Cordon off the areas in the fall zone below the assembly position so that persons cannot be injured by falling objects.
- ➤ Identify the work area with, e.g. signs conforming to the applicable regulations.

3.6 Lightning protection

Caution!
Damage from lightning!
With installation heights of over 20 m, or if the flat collectors project beyond the ridge of the roof, the system can be damaged by lightning strikes.
- ➤ Connect the electrically conducting parts to a lightning protection device.

3.7 Frost protection

Caution!
Damage due to frost!
Residual water can damage the flat collectors in frosty weather.
- ➤ Never fill or flush the flat collector with water.
- ➤ Only fill and flush the flat collector with Vaillant ready-mixed solar fluid.
- ➤ Check the solar fluid regularly with an antifreeze tester.

3.8 Overvoltage protection

Danger!
Risk of death caused by improper installation!
Mains voltage may be present on the pipework as a result of improper installation or a defective power cable, and can cause personal injury.
- ➤ Fasten earthing clamps to the pipework.
- ➤ Bond the earthing clamps to a busbar using 16 mm^2 copper cable.

Caution!
Risk of voltage surge!
Overvoltage can damage the solar system.
- ➤ Earth the solar circuit to provide equipotential bonding and overvoltage protection.
- ➤ Fasten earthing clamps to the solar circuit pipework.
- ➤ Bond the earthing clamps to a busbar using 16 mm^2 copper cable.

4 Interconnection scheme

Observe the planning information when dimensioning the flow rate for the array.

➤ Connect up the flat collectors using the following rules:

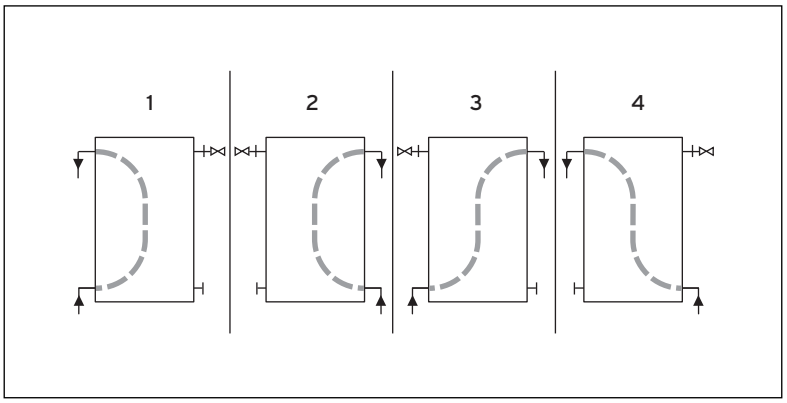

Fig. 4.1 Direction of flow

You can connect the flat collectors hydraulically in four different ways, as shown in the illustration.
However the direction of flow is always from bottom to top.

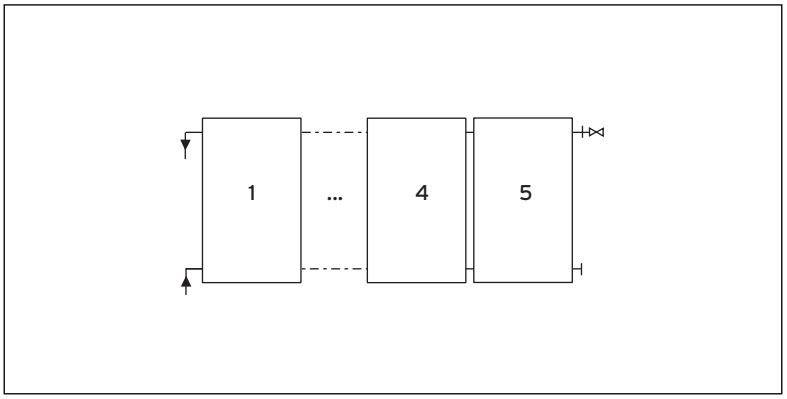

Fig. 4.2 Series connection of 1 - 5 flat connectors

If you connect 1 to 5 collectors one after another, the hydraulic connections can be laid one below the other on one side.

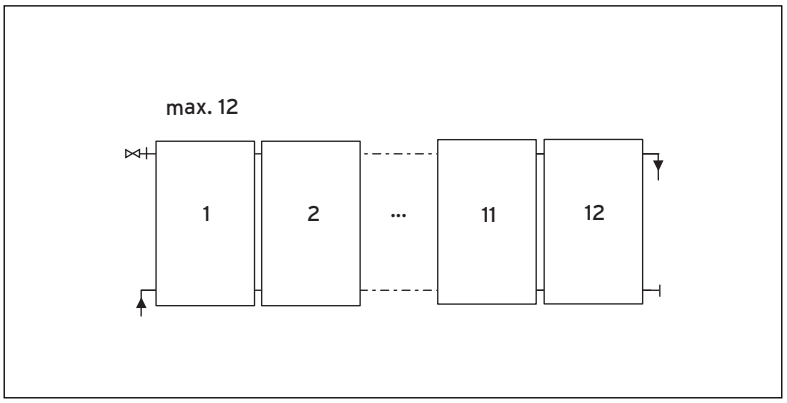

Fig. 4.3 Series connection of 6 - 12 flat connectors

If you connect 6 to 12 collectors one after another, the hydraulic connections must be arranged diagonally, to force a complete flow.

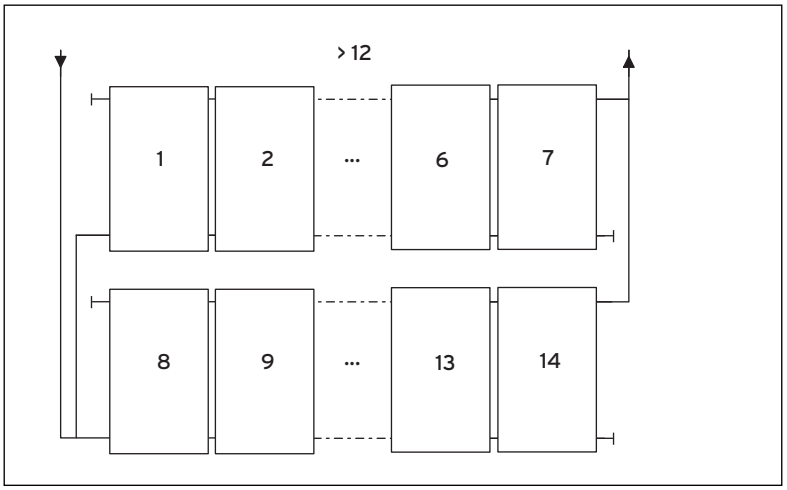

Fig. 4.4 Parallel interconnection (shown here: VFK 145/2V / 155V)

Always connect the individual rows or the complete collector array hydraulically in parallel one above the other.

- ➤ Connect as many flat collectors in series as possible, but never more than 12.
- ➤ Only connect collector rows with the same aperture area in parallel, to prevent differing pressure losses in the partial collector arrays.
- ➤ Make sure that each partial collector array has the same total pipe length in the flow and return lines (Tichelmann System), to prevent differing pressure losses in the connecting pipes.

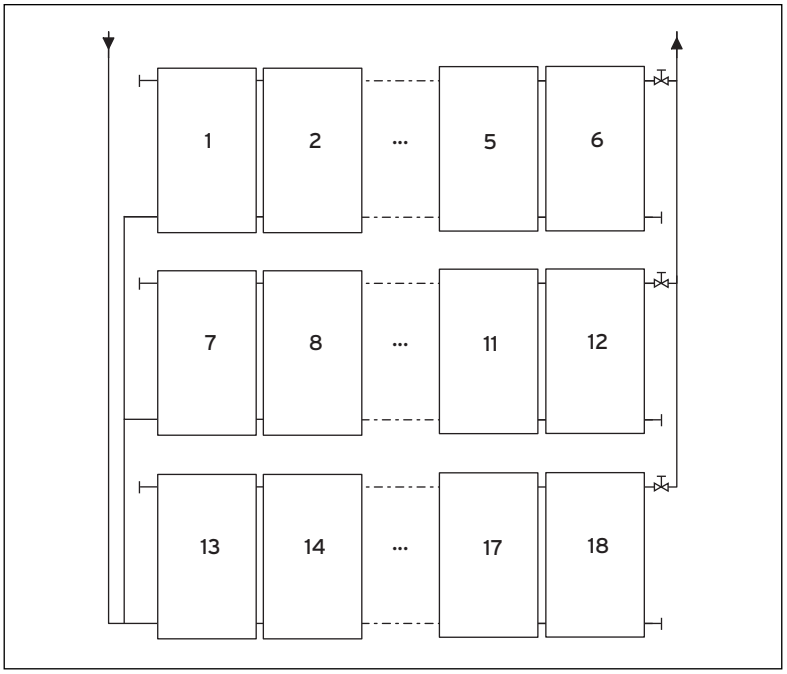

Fig. 4.5 Sizes of the individual rows (shown here: VFK 145/2V / 155V)

Caution!
Danger of air bubbles if venting is inadequate!
With 3 or more collector rows connected in parallel, the following applies: If you do not provide extra bleeding of the individual rows during start-up, air bubbles can occur. To bleed the individual rows, additional stop valves are required.

- ➤ Install a stop valve in the collector flow line ("hot side") of each individual row.
- ➤ Use only stop valves that have been approved for installation in solar heating systems.
- ➤ Bleed the collector array according to the following instructions.

Caution!
Danger of material damage as a result of incorrect fitting!
If the stop valve is closed or incorrectly installed, the flat collector can be damaged by overpressure.

- ➤ Never fit the stop valve in the collector return line.
- ➤ Make sure that the stop valves are open while the system is operating.

The flat collector rows that are connected in parallel must be flushed and bled separately.

- ➤ To this end, open each stop valve in turn a little at a time while the others remain closed.
- ➤ Open all the stop valves after you have flushed and bled all the rows.
- ➤ Then flush and bleed all the collector arrays together. Only in this way can it be ensured that no air remains in the collector arrays.

5 Assembly

This chapter describes the assembly of a multi-row flat collector array which is integrated into a pitched roof.

The assembly of the collectors is always carried out in vertical rows. The hydraulic connections are then attached to the horizontal rows.

- ➤ Before installing the flat collectors in the pitched roof, carry out the steps shown in Chapters 5.1 to 5.5.
- ➤ Then fit the flat collectors into the roof, as described in Chapter 5.6.
- ➤ Before and during the installation, observe the safety instructions listed in Chapter 2, and also the transport and assembly instructions listed in Chapter 3.
- ➤ Connect the flat collectors according to the interconnection diagram in Chapter 4.

Caution!
Roof construction damage due to missing rear roof ventilation!
Inadequate ventilation can result in mould growth.
- ➤ Ensure that the specified roof ventilation is present beneath the collectors.

Caution!
Danger of damaging internal components!
The interior of the collector is vented by the opening integrated in the pipe penetration.
- ➤ Keep the vent opening clear for trouble-free operation.

Caution!
Danger of leaks caused by cutting the cover plates!
Alterations to, or cutting of the supplied cover plates will result in leaks and invalidation of the guarantee.
- ➤ Do not damage the supplied cover plates in any way by cutting them, bending them or similar.

5.1 Required tools

Danger!
Danger of personal injury and material damage!
On roofs made of metals more noble than aluminium (e.g. copper roofs) contact corrosion can occur at the anchors. Collectors can fall down and endanger persons.
- ➤ Use suitable pads to keep the metals apart.

- ➤ Have the following tools and materials ready for the installation of the flat collectors:

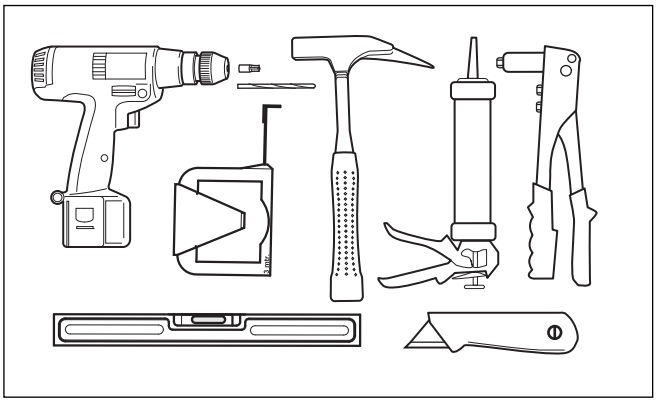

Fig. 5.1 Required tools

- Spirit level,
- Power screwdriver,
- Torx bit,
- Drill bit 4.5 mm,
- Hammer,
- Tape measure/folding ruler,
- Rubber hammer,
- Utility knife,
- Weatherproof silicone and riveting pliers.

5.2 Preparing the roof duct

Caution!
Danger of damage caused by water penetration!
If the roof duct is not implemented correctly, water can penetrate into the interior of the building.
- ➤ Make sure that the roof duct is properly implemented.

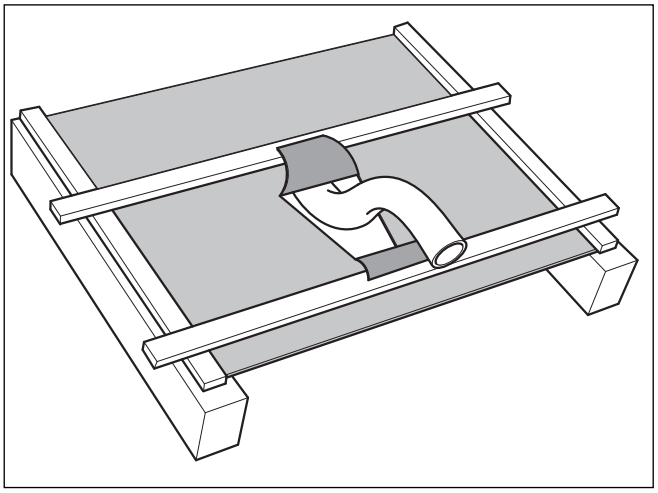

Fig. 5.2 Passing a pipe through the sarking membrane or roofing felt

Cutting the sarking membrane
- ➤ Make a v-shaped cut in the sarking membrane.
- ➤ Fold the upper, wider flap on to the roof batten above, and the lower, narrower flap on to the roof batten below.
- ➤ Fix the sarking membrane tight to the roof batten. This ensures that the dampness flows away to the side.

Preparing board-clad roofs
- ➤ With board-clad roofs, cut out a hole with a padsaw.
- ➤ Make a v-shaped cut in the roofing felt.
- ➤ Fold the upper, wider flap on to the roof batten above, and the lower, narrower flap on to the roof batten below.
- ➤ Fix the roofing felt tight to the roof batten. This ensures that the dampness flows away to the side.

5.3 Installation kits

The following illustrations show which parts you require for multi-row in-roof mounting of vertical or horizontal flat collectors.
- ➤ Have the required parts from the installation kits ready.
- ➤ Check the respective deliveries for completeness using the supplied material lists.

The collectors are arranged on top of and next to one another:
- 2 to 12 collectors next to one another,
- 2 or more collectors on top of one another (depending on the height of the roof).

Furthermore, with the VFK H it is only possible to mount two collectors on top of one another.

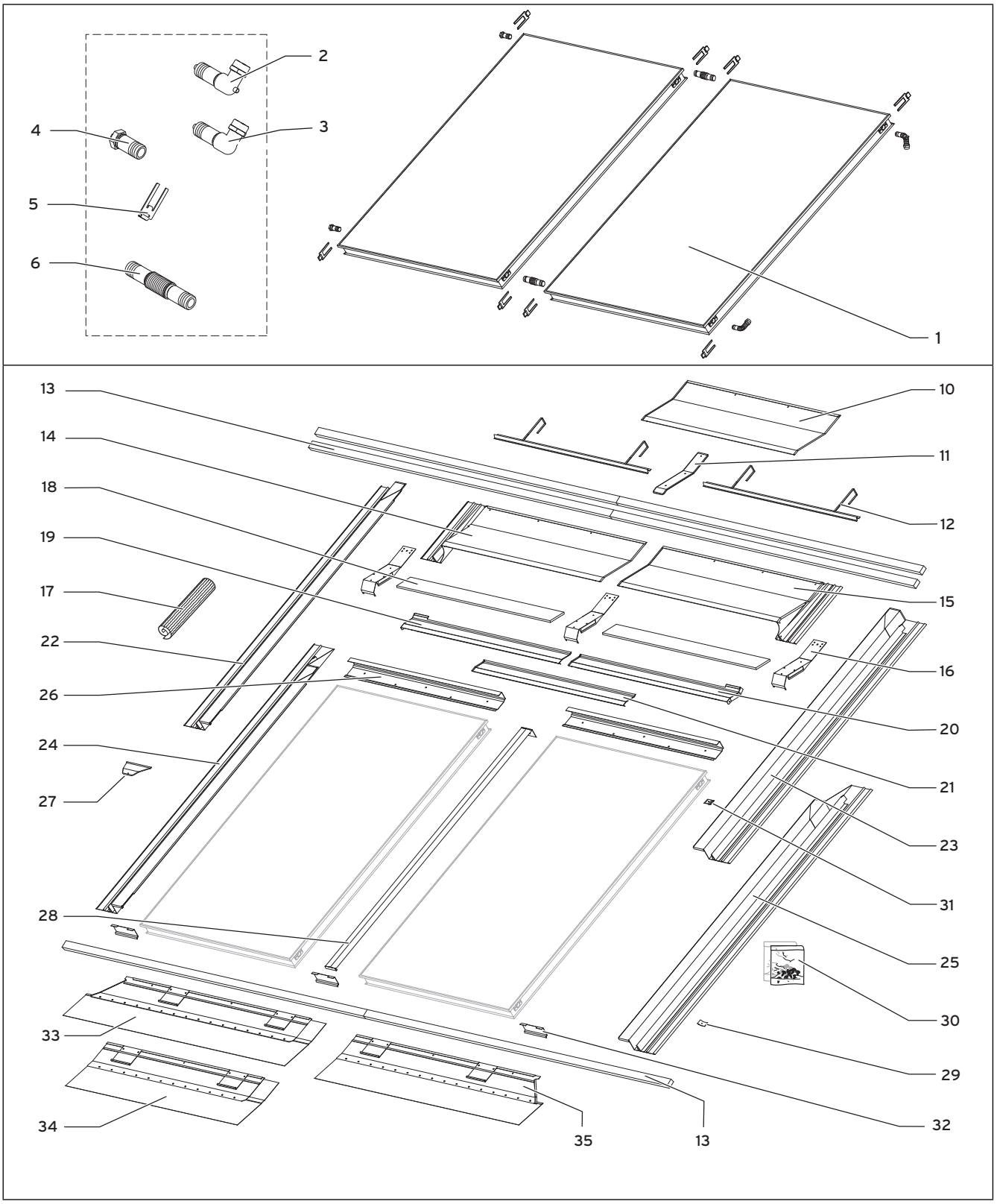

Fig. 5.3 Installation kit for vertical collector (VFK 145/2/155 V)

Item	Description
1	Collector
2	Upper supply (with probe)
3	Return (inlet)
4	Plug (with vent)
5	Clip
6	Pipe coupling
10	Centre ridge plate
11	Upper ridge plate coupling
12	Tile support
13	Additional roof batten
14	Left ridge plate
15	Right ridge plate
16	Lower ridge plate coupling
17	Flexible easyform apron (can be ordered as option)
18	Support board
19	Left hand horizontal intermediate plate
20	Right hand horizontal intermediate plate
21	Centre horizontal intermediate plate
22	Upper left shorter side section
23	Upper right shorter side section
24	Lower left longer side section
25	Lower right longer side section
26	Spacer
27	Trapezoidal plate
28	Vertical intermediate plate
29	Clamp
30	Screw kits (Nos. 1-4)
31	Bracket
32	End cap
33	Left hand front section
34	Centre front section
35	Right hand front section

Table 5.1 Kit for vertical collector (VFK 145/2/155 V)

Collector array packaging
You require one hydraulic installation set for each collector row and one hydraulic expansion set for each collector per row.

Note on additional roof battens (Item 13)
The installation kit contains additional roof battens. However, the additional battens that you use during installation must be neither thicker nor thinner than the existing ones.

➤ If the additional roof battens in the installation kit have differing dimensions from the existing roof battens, battens that are identical to the existing ones should be provided locally.

Screw kits (Nos. 1 - 4) (Item 30)
The screw kits contain the following screws:

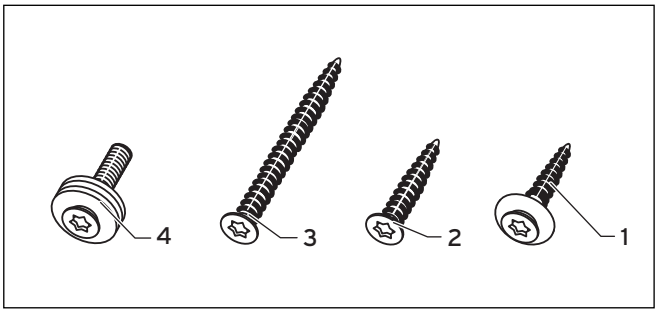

Fig. 5.4 Material supplied in screw kits

Screw No.	Used with → item number in Table 5.1
1 4.5 x 25 mm	11, 10, 14, 15, 33, 34, 35
2 5 x 30 mm	31, 26, 29, 16, 18
3 5 x 70 mm	13
4 M5 x 25/A2	11

Table 5.2 Screw usage

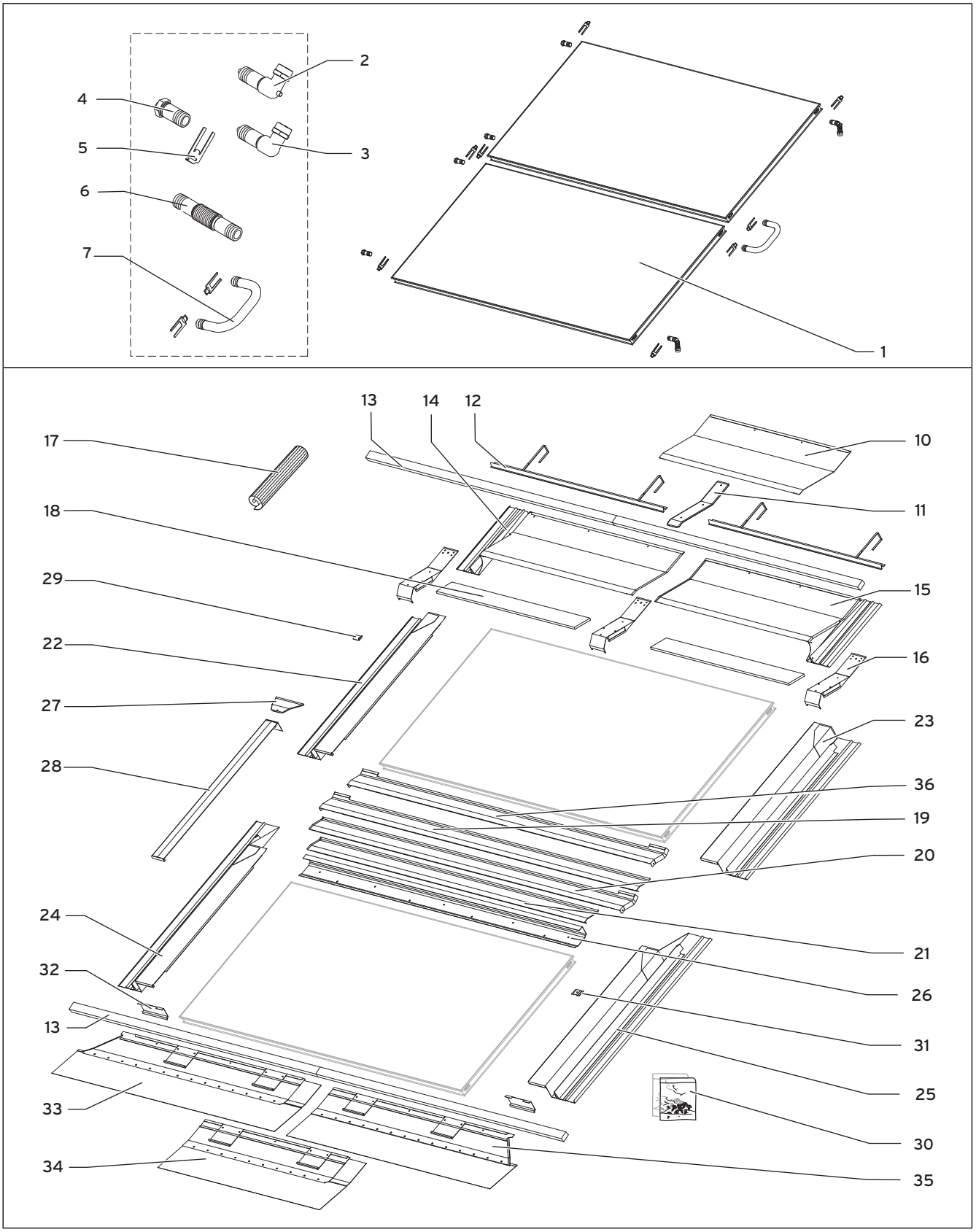

Fig. 5.5 Installation kit for horizontal collector (VFK 145/2/155 H)

Item	Description
1	Collector
2	Upper supply (with probe)
3	Return (inlet)
4	Plug (with vent)
5	Clip
6	Pipe coupling (**Not** for "two VFK Hs on top of one another")
7	O-ring pipe coupling (**Only** for "two VFK Hs on top of one another")
10	Centre ridge plate
11	Upper ridge plate coupling
12	Tile support
13	Additional roof batten
14	Left ridge plate
15	Right ridge plate
16	Lower ridge plate coupling
17	Flexible easyform apron (can be ordered as option)
18	Support board
19	Left hand horizontal intermediate plate (only for multi-row)
20	Right hand horizontal intermediate plate (only for multi-row)
21	Centre horizontal intermediate plate (only for multi-row)
22	Upper left shorter side section
23	Upper right shorter side section
24	Lower left longer side section
25	Lower right longer side section
26	Spacer
27	Trapezoidal plate
28	Vertical intermediate plate
29	Clamp
30	Screw kits (Nos. 1-4)
31	Bracket
32	End cap
33	Left hand front section
34	Centre front section
35	Right hand front section
36	Horizontal intermediate plate (only for single row)

Table 5.3 Kit for horizontal collector (VFK 145/2/155 H)

Collector array packaging
You require one hydraulic installation set for each collector row and one hydraulic expansion set for each collector per row.

Note on additional roof battens (Item 13)
The installation kit contains additional roof battens. However, the additional battens that you use during installation must be neither thicker nor thinner than the existing ones.

➤ If the additional roof battens in the installation kit have differing dimensions from the existing roof battens, battens that are identical to the existing ones should be provided locally.

Screw kits (Nos. 1 - 4) (Item 30)
The screw kits contain the following screws:

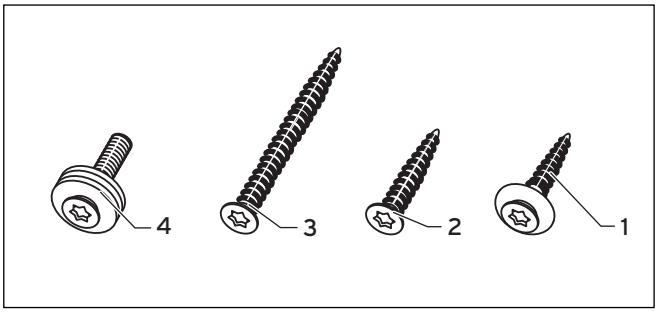

Fig. 5.6 Material supplied in screw kits

Screw No.	Used with → item number in Table 5.3
1 4.5 x 25 mm	11, 10, 14, 15, 33, 34, 35
2 5 x 30 mm	31, 26, 29, 16, 18
3 5 x 70 mm	13
4 M5 x 25/A2	11

Table 5.4 Screw usage

5.4 Installation dimensions

- Before installing the flat collectors, make sure you are clear about the installation dimensions of the collector array.
- Maintain a distance of at least 1 metre from the edges of the roof and the ridge.
- Do not fit the collectors on a roof overhang.

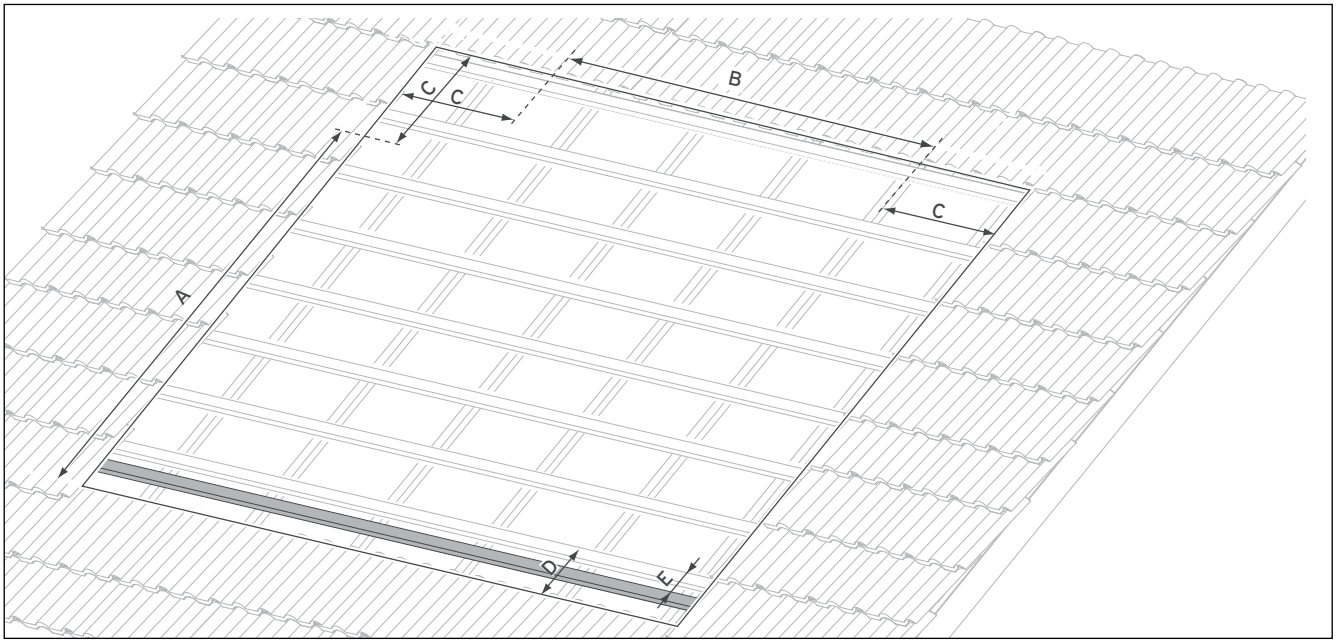

Fig. 5.7 Dimensions for the installation area and the position of the lower roof batten (the reference line in each case is the roof tile border)

	Number of collectors	1	2	3	4	5	6	7	8	9	10	11	12
Vertical collector position	Height of collector array (**A**)		4720	6830	8940	11050	13160	15260	17370	19480	21590	23700	25800
	Width of collector array (**B**)		3330	4600	5860	7120	8390	9650	10910	12170	13440	14700	15960
Horizontal collector position	Height of collector array (**A**)		3110	4412	5720	7030	8390	9650	10960	12226	13570	14880	16190
	Width of collector array (**B**)	2960	5020	7080	9150	11210	13270	15340	17400	19460	21530	23590	25650
Both collector positions	Additional working area (**C**)	500											
	Distance (**D**)	270 - 320											
	Distance (**E**)	150											

Table 5.5 Dimensions for the installation area and the position of the bottom roof batten in mm

The entire installation area consists of the dimensions for the collector array (**A**) and (**B**) and also the additional exposed area (**C**).

The additional exposed area (**C**) is needed in order to be able to carry out the installation work. After assembly the additional exposed area (**C**) is covered up again.

5.5 Installation

Multi-row in-roof mounting of Vaillant flat collectors is always carried out in vertical rows. The flat collectors have a horizontal orientation (VFK H) or a vertical orientation (VFK V). They are arranged on top of one another and next to one another in a collector array:

- 2 to 12 collectors next to one another
- 2 or more collectors on top of one another (depending on roof height)

Furthermore, with the VFK H it is only possible to mount two collectors on top of one another.

Generally, the installation steps and the instructions described in this manual are valid for both collector positions and for all array arrangements.

Any different installation steps are clearly pointed out:

Only for the horizontal collector position

Only for the vertical collector position

Only when two VFK Hs are on top of one another

5.5.1 Preparing the roof

Danger!
Danger of personal injury and material damage caused by a collapsing roof!
A roof with insufficient load-bearing capacity can collapse as a result of the additional loading caused by the flat collectors.
- ➤ Before installation, check the maximum roof load!
- ➤ If necessary, call a technician.

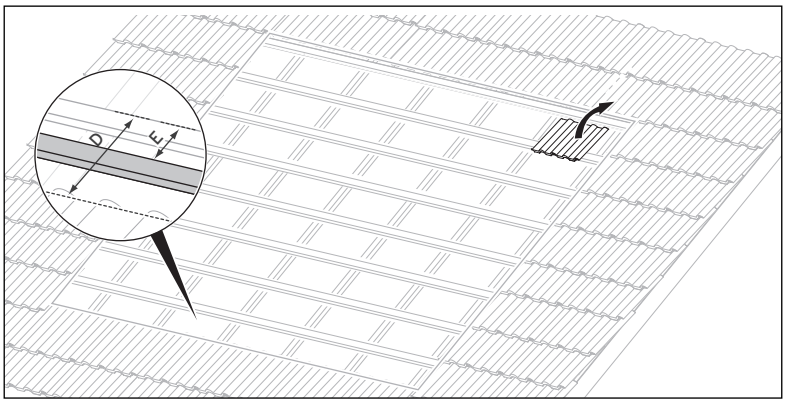

Fig. 5.8 Exposing the installation area and fitting the lower roof batten

- ➤ Using the dimensions (➞ **Fig. 5.7, Table 5.5**) define the installation area on the roof.
- ➤ Remove the tiles.

There must be a roof batten at the lower edge of the collector array corresponding to distances D and E in Table 5.5.
- ➤ If there is no roof batten at the corresponding position, attach an additional batten.
- ➤ Make sure that the ends of roof batten are resting centrally on a rafter.
- ➤ Screw the roof batten firmly to each rafter using one of the supplied No. **3** screws (➞ **Table 5.2/5.4**) in each case.

5.5.2 Laying out the collectors

- ➤ Before starting assembly of a vertical row of collectors, lay out all the collectors of the upper rows unpacked on the roof.

The collectors for the lowermost row (this is where the assembly begins!) are fitted first.
- ➤ Follow the steps below:

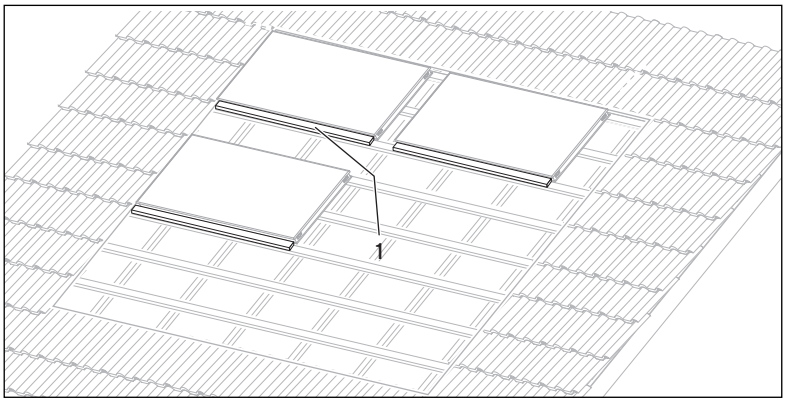

Fig. 5.9 Laying out the collectors

- ➤ At the mounting point for each of the collectors above the lowermost row, fix an additional roof batten (**1**) to the existing roof batten.
- ➤ Firmly screw the additional roof batten at two fixing points using the supplied No. **3** screws (➞ **Table 5.2/5.4**).

Additional roof battens are included in the delivery (➞ **Table 5.1/5.3, Item 13**).
The additional roof battens (**1**) secure the collectors from falling during temporary storage.
- ➤ Lay the collectors one after another at the respective mounting points on the roof batten (**1**).

5.5.3 Fitting the front sections

- ➤ Fit the front sections in each case at the start of a vertical collector row.
- ➤ Keep exactly to the sequence described here when doing so.

For the horizontal collector position you will require two front sections for each vertical row.

For the vertical collector position you will require one front section for each vertical row.

Caution!
Leaks caused by inaccurate mounting position!
Leaks can occur in the collector system if the framework parts are not assembled precisely.
- ➤ Make sure that the fold on the front section rests flush on the roof batten.
- ➤ With the help of a spirit level, make sure that the front section is resting horizontally on the roof batten.

5.5.3.1 Left hand front section

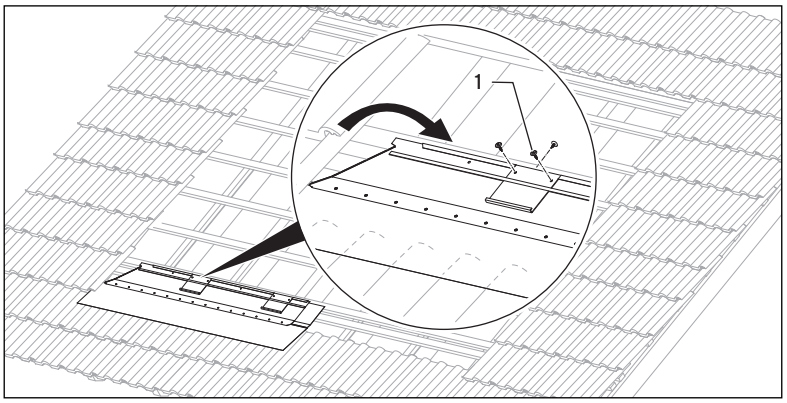

Fig. 5.10 Attaching the left hand front section at the bottom

- ➤ Pick up the left hand front section (➞ **Table 5.1/5.3, Item 33**).
- ➤ Fit the left hand front section of the frame to the 2nd roof batten viewed from below. The front section will thus rest on the lowest roof batten (the previously fitted additional roof batten).
- ➤ Leave the protective film on the adhesive surface of the flexible apron.
- ➤ Let the flexible apron rest on the roof tiles and push the left hand edge of the apron between the tiles.
- ➤ Screw the front section to the roof batten with 6 No. **1** screws (➞ **Table 5.2/5.4**) using the Torx bit, as shown in (**1**).

Only for the vertical collector position

- ➤ Continue with the assembly of the vertical collector row.

Only for the horizontal collector position

- ➤ First attach the second front section as described in the following.

5.5.3.2 Remaining front sections (centre and right hand front sections)

- ➤ Always use a centre front section, up to and including the last but one vertical collector row (**→ Table 5.1/5.3, Item 34**):
  - For all VFK 145/2/155 **V**, 1 centre front section is required.
  - For all VFK 145/2/155 **H**, 2 centre front sections are required.
- ➤ Complete the row of front sections with a right hand front section (**→ Table 5.1/5.3, Item 35**).
- ➤ Proceed for all the other front sections as described in the following using the second (centre) front section as an example:

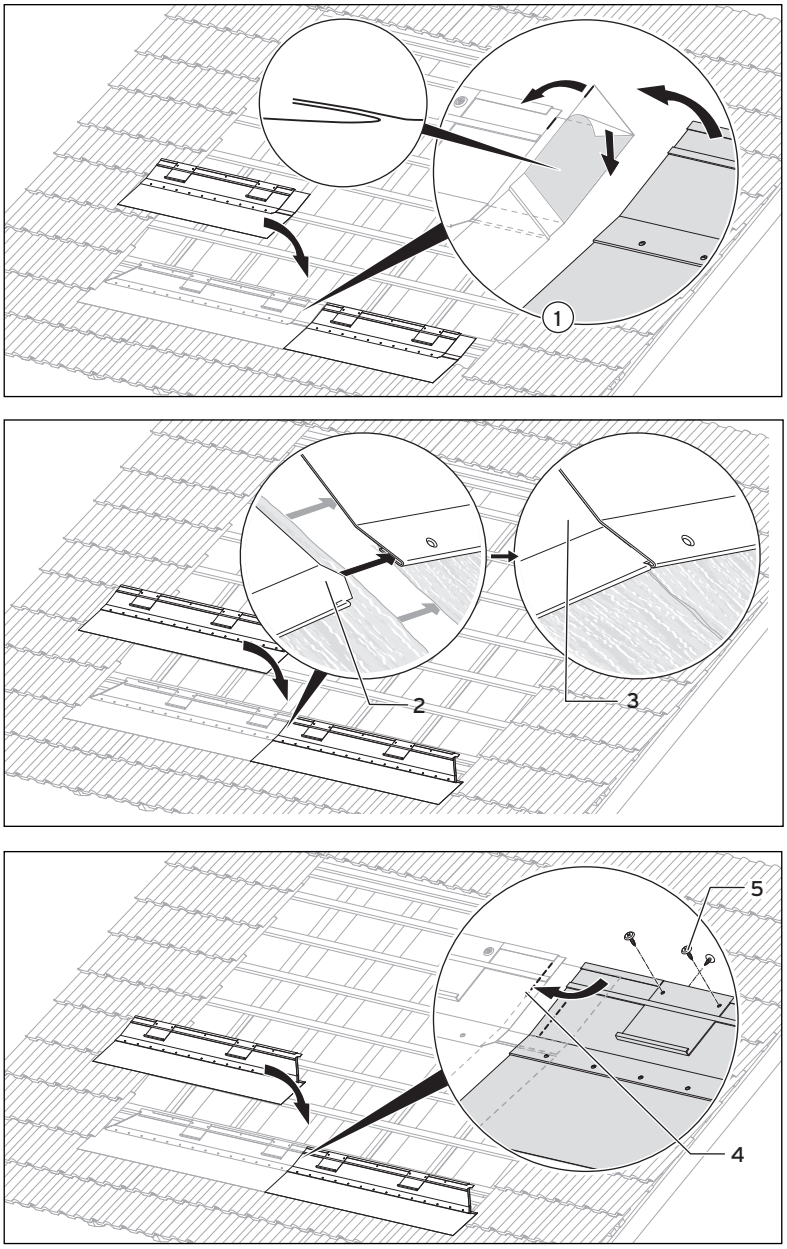

Fig. 5.11 Fitting a further front section (here, a right hand or centre front section)

- Have the centre (or right hand) front section (→ **Table 5.1/5.3, Item 34**) of the frame ready.
- Bend the flexible apron of the previously fitted front section down by approx. 3 cm on its right hand side (**1**).
- Lift the upper protective film on the bent flexible apron at the top as far as the bend (**1**).
- Stick the right hand sheet to the bent over apron of the left hand sheet (**1**).
- Take care that the edge of the sheet and the apron close flush with one another.
- Push the slot on the left hand sheet into the fold on the right hand sheet (**2**) and (**3**).
- Align the right hand sheet to the mark on the left hand sheet (**4**).
- Now remove the entire **upper** protective film from the adhesive surface on the left hand sheet.
- Then press once more on the right hand sheet.
- Screw the sheet to the roof batten (**5**) with 6 No. **1** screws (→ **Table 5.2/5.4**) using the Torx bit.

Only for the vertical collector position

- Continue with the assembly of the vertical collector rows after fitting a front section for each one. The remaining front sections are fitted when starting each additional vertical row.

Only for the horizontal collector position

- Continue with the assembly of the vertical collector rows after fitting two front sections for each row. Further front sections are fitted when starting each additional vertical row.

5.5.4 Fitting the first vertical collector row

Before fitting the first collector, you must have prepared the roof (➙ **Chapter 5.5.1**), laid out the collectors ready for a vertical row (➙ **Chapter 5.5.2**) and have fitted the required front sections (➙ **Chapter 5.5.3**).

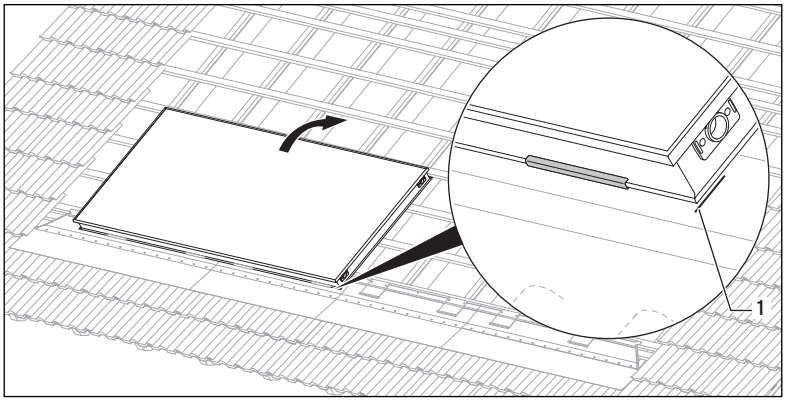

Fig. 5.12 Inserting the left hand collector

- Hook the left hand collector to the straps on the front section.
- Align the collector laterally with the mark (**1**) on the front section.
- Make sure that the collector is sitting horizontally.

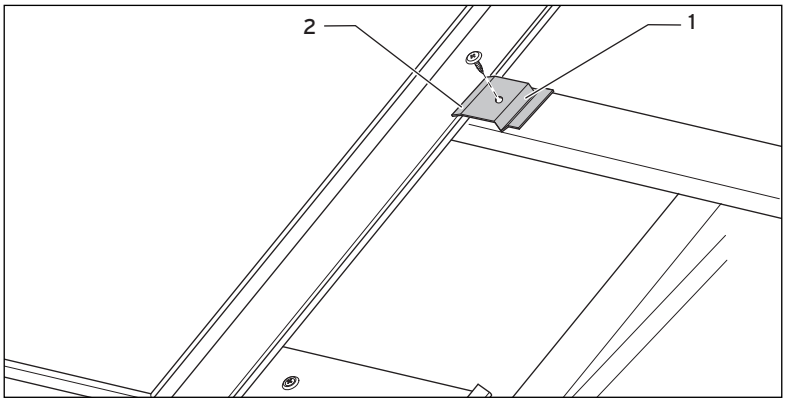

Fig. 5.13 Screwing the flat collectors

- Screw the collector firmly to the roof battens with 2 of the supplied brackets (➙ **Table 5.1/5.3, Item 31**) and No. **2** screws (➙ **Table 5.2/5.4**) on each side using the Torx bit.
  The folded side (**1**) of the clamp must point away from the collector.
- Take care that the chamfered side (**2**) of the clamp grips the edge of the collector.

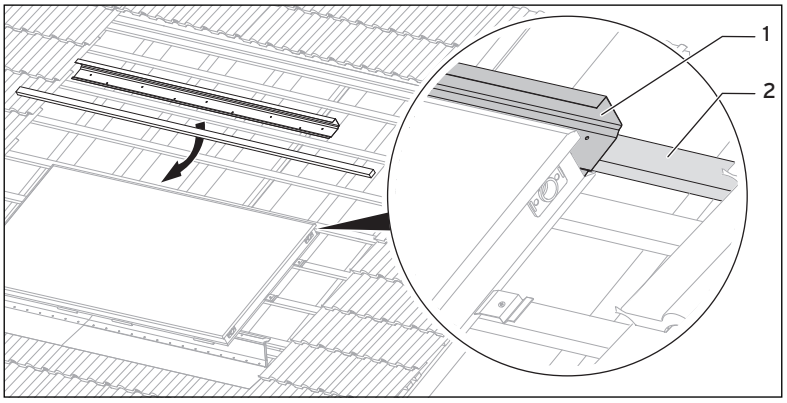

Fig. 5.14 Positioning the spacer and roof batten

- Attach a spacer (**1**) (➙ **Table 5.1/5.3, Item 26**) to the collector.
- If there is no roof batten under the spacer, fit an additional batten (**2**) (➙ **Table 5.1/5.3, Item 13**) under it.
- Take care that the additional roof batten is of the same dimensions as the existing ones.
- Make sure:
  - that the spacer is resting flush with the inner edge of the collector,
  - that the roof batten is positioned so that the holes in the spacer are lying above the batten,
  - that the roof batten under it is resting flush on the outer edge of the collector,
  - that the roof batten terminates in the middle of a rafter and abuts with the next batten.

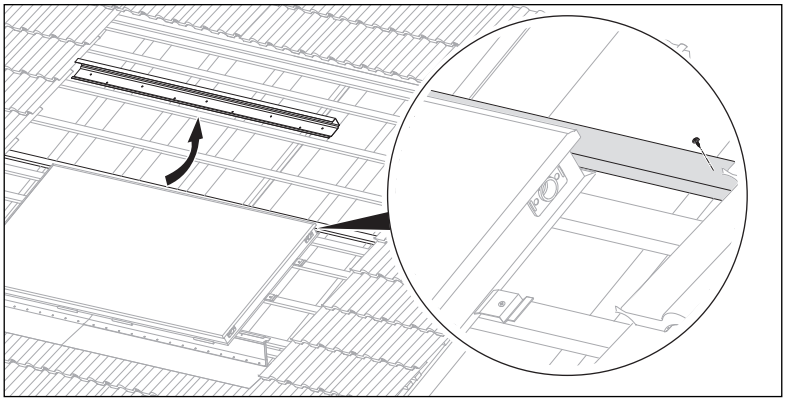

Fig. 5.15 Screwing the roof batten

- ➤ Screw the roof batten firmly to the rafters at the right and left next to the spacer using No. **3** screws (➞ **Table 5.2/5.4**).
- ➤ Remove the spacer.
- ➤ Keep the position of the roof batten unchanged and screw the batten to each rafter using the supplied No. **3** screws (➞ **Table 5.2/5.4**).

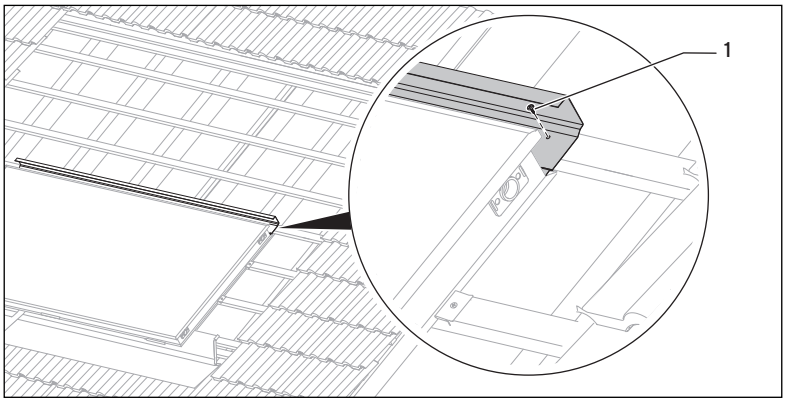

Fig. 5.16 Screwing the spacer

- ➤ Lay the spacer (**1**) once more on the collector and the previously fitted roof batten.

Caution!
Leaks caused by inaccurate mounting position!
Leaks can occur in the cover plates for roof integration if the mounting position of the spacer is not precise.

- ➤ Take care that the spacer
  - is lying horizontally,
  - is resting flush at the side on the inner edge of the collector,
  - terminates at the ends in line with the inner edge of the collector.

- ➤ Screw the spacer to the roof batten above the collector with the supplied No. **2** screws (➞ **Table 5.2/5.4**) using the Torx bit.

Danger!
Risk of death caused by improper assembly!
If not fixed properly, the flat collector can fall off and endanger persons.

- ➤ After fixing each collector, check that all screwed connections are tight and retighten them if necessary.

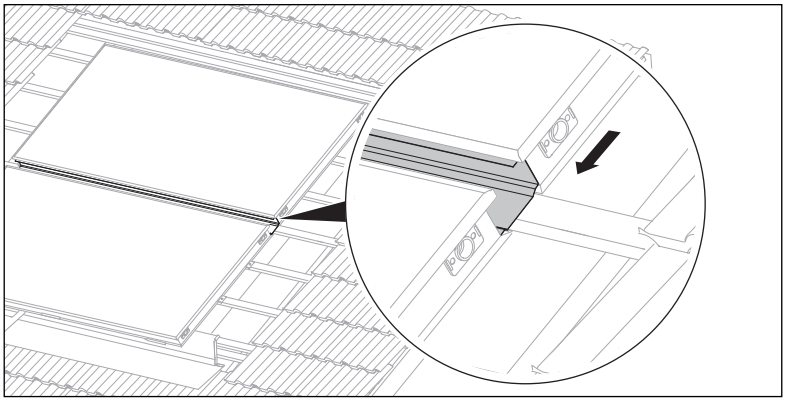

Fig. 5.17 Fitting the next collector

- To fit the next collector, first remove the additional roof batten with which you previously secured the collector(**→ Fig. 5.9, Chapter 5.5.2**).
- Once you have removed the additional roof batten, let the collector slide down slowly until it is resting on the spacer.

Caution!
Leaks caused by inaccurate mounting position!
Leaks can occur in the cover plates for roof integration if the mounting position of the collectors is not precise.
- Take care that the spacer
  - is resting flush at the side on the inner edge of the collector,
  - terminates at the ends in line with the inner edge of the collector.
- Using a spirit level, make sure
  - that the collectors line up above one another,
  - that the collector is lying horizontally.

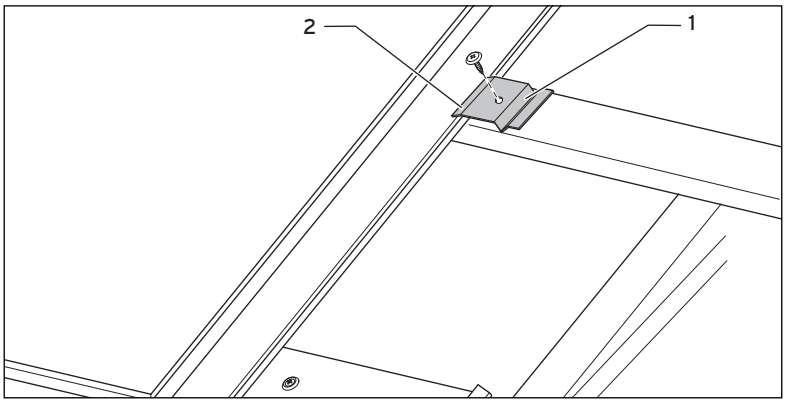

Fig. 5.18 Screwing the flat collectors

- Screw the collector firmly to the roof battens with 2 of the supplied brackets (**→ Table 5.1/5.3, Item 31**) and No. **2** screws (**→ Table 5.2/5.4**) on each side using the Torx bit.
  The folded side (**1**) of the clamp must point away from the collector.
- Take care that the chamfered side (**2**) of the clamp grips the edge of the collector.

- Fit the collectors for the entire vertical row in the manner previously described (**→ Figs. 5.12 to 5.18**).
- Then make the hydraulic connections as follows.

Only when two VFK Hs are on top of one another

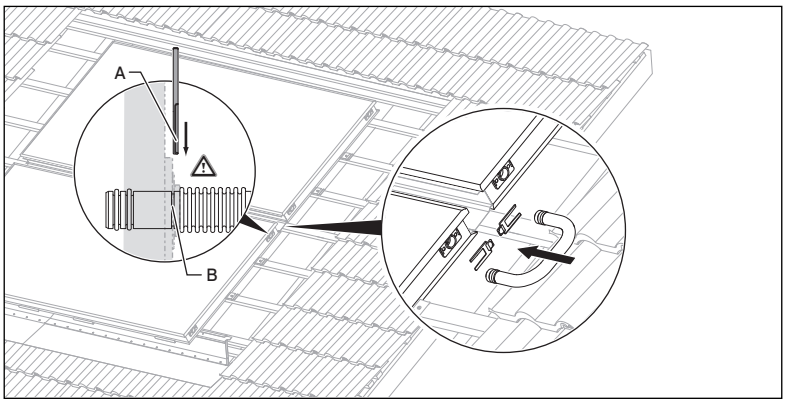

Fig. 5.19 Hydraulic connection (2 VFK H on top of one another)

- Connect the collectors with the O-ring pipe coupling (→ **Table 5.3, Item 7**).
- Fix the connection with the clips.

Caution!
Danger of damage to the collectors!
The flat collector can be damaged if the pipe coupler is not fitted correctly.
- Make sure that the clip (**A**) slides into the slot in the O-ring pipe coupler (**B**).

Danger!
Risk of death caused by improper assembly!
If not fixed properly, the flat collector can fall off and endanger persons.
- After fixing each collector, check that all screwed connections are tight and retighten them if necessary.

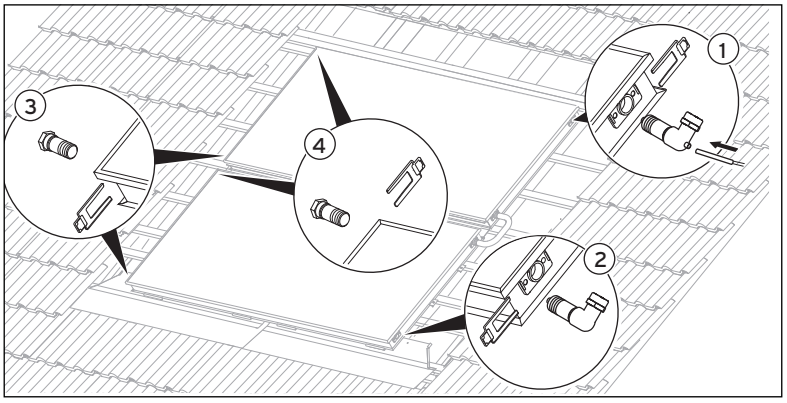

Fig. 5.20 Hydraulic connections for the VFK 145/2/155

- Connect the flow line (outlet with opening for collector sensor, → **Table 5.3, Item 2**) at the top (**1**).
- Insert the collector sensor into the opening provided in the flow line.
- Connect the return line (inlet, → **Table 5.3, Item 3**) at the bottom (**2**).
- Fit the 2 plugs (→ **Table 5.3, Item 4**) with the bleed openings (**3** and **4**) on the opposite side of each collector.
- Secure the connections and plugs with the clips (→ **Table 5.3, Item 5**).
- Connect the collector flow and return lines to the system with the connecting pipes.
- If necessary check the connections for leaks.

For all other arrangements (VFK H/V)

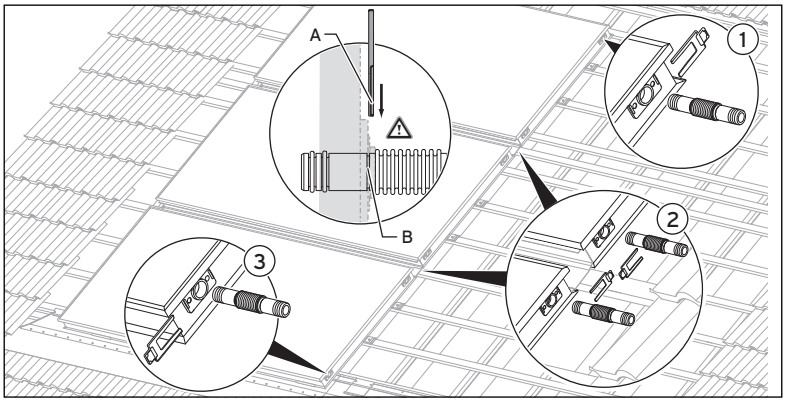

Fig. 5.21 Hydraulic connection

- Insert the pipe couplers (➙ **Table 5.1/5.3, Item 6**) into the side openings in the collector until the end stops are reached (**1**).
- Secure the pipe couplings with the clips (**2**).

Caution!
Danger of damage to the collectors!
The flat collector can be damaged if the pipe coupler is not fitted correctly.
- Make sure that the clip (**A**) slides into the slot in the pipe coupler (**B**).

Danger!
Risk of death caused by improper assembly!
If not fixed properly, the flat collector can fall off and endanger persons.
- After fixing each collector, check that all screwed connections are tight and retighten them if necessary.

5.5.5 Fitting the remaining vertical collector rows

- Before assembling the next vertical row, lay down the collectors as described in Chapter 5.6.2.
- Fit the required front section in front of the collectors (➙ **Chapter 5.5.3, Fig. 5.10**).

Danger!
Risk of death caused by improper assembly!
If not fixed properly, the flat collector can fall off and endanger persons.
- After fixing each collector, check that all screwed connections are tight and retighten them if necessary.

Caution!
Leaks caused by inaccurate mounting position!
Leaks can occur in the cover plates for roof integration if the mounting position of the collectors is not precise.
- Using a spirit level, make sure that the collectors are sitting horizontally and are resting flush with one another.
- Make sure that the distance between the collectors is 30 +/- 1mm.

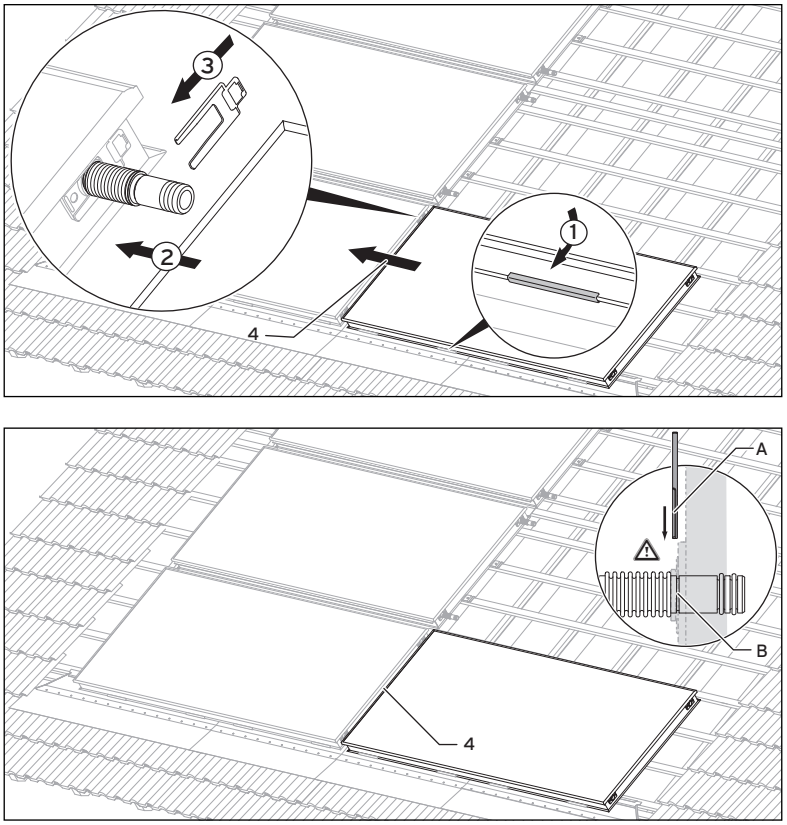

Fig. 5.22 Inserting the next collector

- ➤ Hook the next collector to the straps of the front section (**1**).
- ➤ Slide the collector left to the neighbouring collector (**2**). Make sure when doing this
  - that the collector being fitted slides under the clamps on the neighbouring collector to the left as far as the end stop.
  - that pipe couplings slip and fit in the side openings.
- ➤ Align the collector to the marks on the front sections.
- ➤ Secure the pipe couplings with the clips (**3**).
- ➤ Check the distance between adjacent collectors (**4**). It must be 30 mm (± 1 mm).
- ➤ Fasten the collector at the side to the roof battens with 2 each of the supplied clamps (**➞ Table 5.1/5.3, Item 29**) and the No. **2** screws (**➞ Table 5.2/5.4**) (cf. Fig. 5.12).

Caution!
Danger of damage to the collectors!
The flat collector can be damaged if the pipe coupler is not fitted correctly.
- ➤ Make sure that the clip (**A**) slides into the slot in the pipe coupler (**B**).

- ➤ Then continue the assembly as for the first vertical row of collectors:
  - Screw down the flat collectors (**➞ Fig. 5.13**).
  - Position the spacer and roof batten (**➞ Fig. 5.14**).
  - Screw the spacer and roof batten down (**➞ Figs. 5.15, 5.16**).
  - Position the next collector (**➞ Fig. 5.17**). When doing this, take care that the left hand side of the collector slides under the brackets on the neighbouring collector until it reaches the end stop.
  - Screw the flat collector down.

- ➤ Complete the collector row and the entire collector array in the manner already described.

- ➤ Then make the hydraulic connections.

Whereas the assembly of the collectors takes place in vertical rows, the hydraulic connections are always made in horizontal rows.

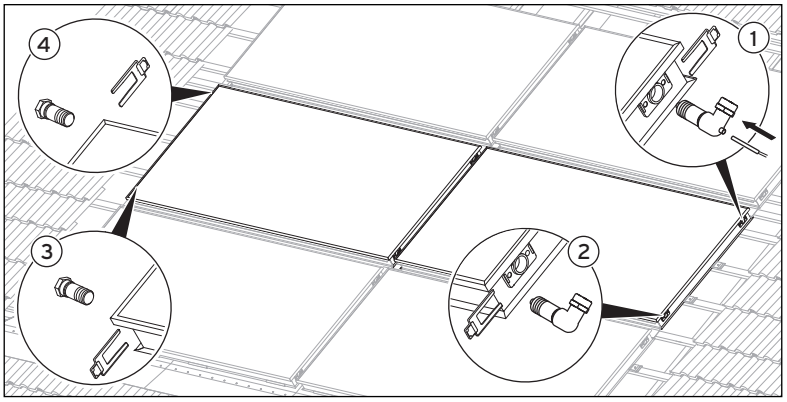

Fig. 5.23 Fitting the hydraulic connections (1-5 collectors)

Procedure for a horizontal row of up to 5 collectors.

- ➤ Connect the flow line (outlet with opening for collector sensor) (**1**) at the top on one side.
- ➤ Connect the return (inlet) (**2**) at the bottom.
- ➤ Fit the two plugs with bleed openings at the top and bottom of the collector on the other side of the collector array (**3** and **4**).
- ➤ Secure the connections and plugs with the clips.
- ➤ Connect the collector flow and return lines to the system with the connecting pipes.

- ➤ Perform the previously listed steps for all horizontal rows.

After assembly of all rows:

- ➤ Remove the red plug from the outlet on the uppermost row of the collector array.
- ➤ Insert the collector sensor into the opening.
- ➤ Use a cable tie to prevent the collector sensor from slipping out.

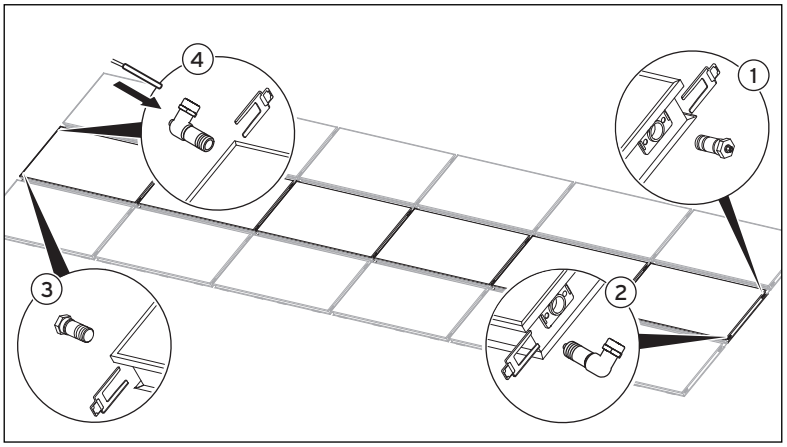

Fig. 5.24 Fitting the hydraulic connections (6-12 collectors)

If you connect 6 or more collectors one after another, the hydraulic connections must be arranged diagonally, to force a complete flow.

Procedure for a horizontal row:

- ➤ Fit a plug with bleed opening (**1**) on one side at the top.
- ➤ Insert the return line (inlet) (**2**) into the lower opening at the side.
- ➤ Insert the flow line (outlet with opening for collector sensor) (**4**) into the upper side opening diagonally opposite.
- ➤ Fit a further plug with bleed opening (**3**) at the bottom.
- ➤ Secure the connections and plugs with the clips.
- ➤ Connect the collector flow and return lines to the system with the connecting pipes.
- ➤ Perform the previously listed steps for all horizontal rows.

After assembly of all rows:
- ➤ Remove the red plug from the outlet on the uppermost row of the collector array.
- ➤ Insert the collector sensor into the opening.
- ➤ Use a cable tie to prevent the collector sensor from slipping out.
- ➤ Fill the entire collector system. Use the Vaillant filling trolley to prevent air bubbles.
- ➤ Perform a check for leaks.
- ➤ Remove the protective film from the collectors.

5.5.6 Fitting the side sections and intermediate plates

The different side sections and the various intermediate plates **must** be fitted in a particular sequence:
- **Long side section**, left, on the left hand collector on the lowest horizontal row.
- **Long side section**, right, on the right hand collector on the lowest horizontal row.
- First, the **vertical intermediate plate**, when at least 2 collectors are laid next to one another.
- **Horizontal intermediate plates**, when at least 2 collectors are laid on top of one another.
- **Further long side sections** left and right, to complete each row of collectors.
- **Further vertical intermediate plates**, when more than 2 collectors are laid next to one another.
- **Further horizontal intermediate plates**, when more than 2 collectors are laid on top of one another.
- **In the last row** at the top in front of the ridge:
  - **Short side section left**
  - **Short side section right**

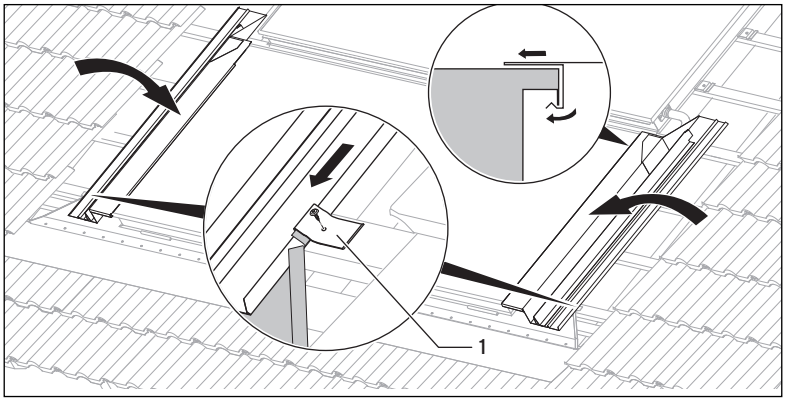

Fig. 5.25 Fastening the longer bottom side sections

If you are fitting two or more collectors next to or on top of one another, then proceed initially by attaching the intermediate plates **(→ Figs. 5.26, 5.27)**. Then attach the right hand side sections for each row.

- ➤ First fit the lower, longer side sections **(→ Table 5.1/5.3, Item 24/25).**
- ➤ Remove the film from the longer side sections.
- ➤ Slide the left hand longer side section over the first collector in the lower horizontal row.
- ➤ Take care that the respective side section is resting flush with the lower edge of the collector and is engaged, as any subsequent movement will no longer be possible, due to the adhesion.
- ➤ Fit the right hand long side section to the right hand collector on the bottom horizontal row in the manner just described.
- ➤ **Fix the longer side sections to the roof battens with the supplied brackets (1). (→ Table 5.1/5.3, Item 31) and No. 2 screws (→ Table 5.2/5.4) using the Torx bit.**

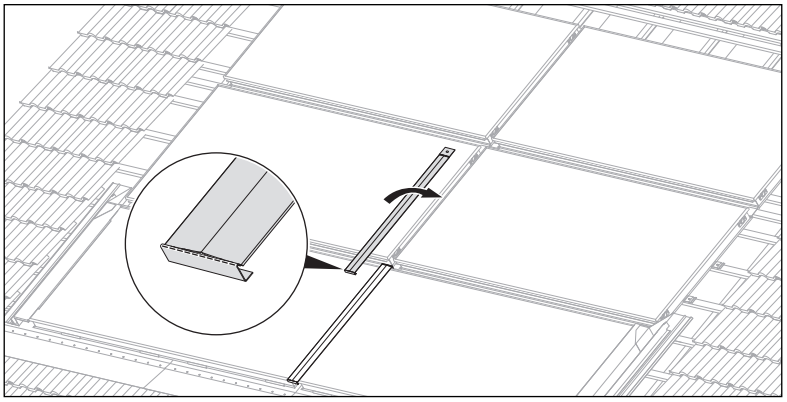

Fig. 5.26 Attaching the vertical intermediate plates

- Press the vertical intermediate plate (**→ Table 5.1/5.3 Item 28**) into the vertical space between the collectors. Take care that the perforation is flush with the lower edge of the collector at the bottom.
- Bend the plate downwards (**→ Fig. 5.26**) so that it reaches under the edge of the collector and ends flush with it.

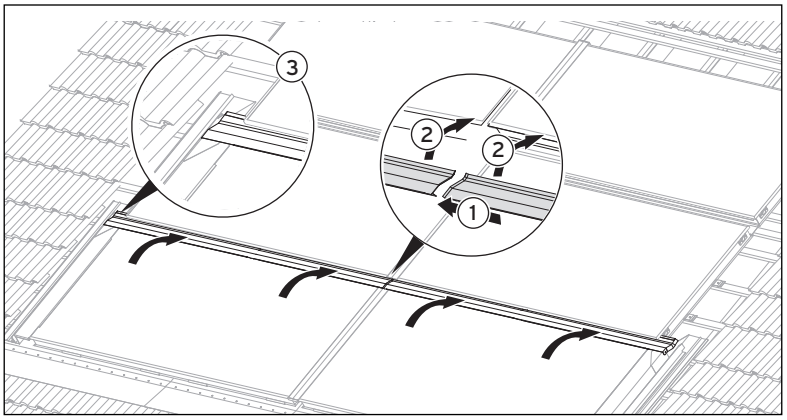

Fig. 5.27 Fastening the intermediate plates (here, horizontal)

- Pick up one or more horizontal intermediate plates. Proceed according to the following criteria:

Number of collectors on top of one another	Item number of the plate from Table 5.1 / Table 5.3
2	1 x No. 19, 1 x No. 20
Number of collectors next to one another	**Item number of the plate from Table 5.1 / Table 5.3**
3	1 x No. 19, 1 x No. 20, 1 x No. 21
4	1 x No. 19, 1 x No. 20, 2 x No. 21
n	1 x No. 19, 1 x No. 20, n x No. 21

Only when two VFK Hs are on top of one another

- An intermediate plate with the number 36 from Table 5.3.

- Slide the horizontal intermediate plate between the edge of the collector and the spacer for the upper collector (**2**).
- Slide the plate over the upper edge of the lower collector until it can be felt locking.
- Slide the intermediate plates together at the cross joint (**1**).

The first plate on the left and the last plate on the right must rest flush on the respective collectors (**3**).

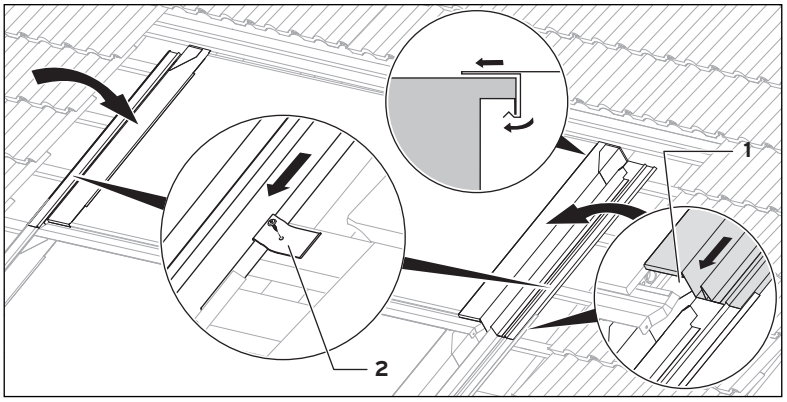

Fig. 5.28 Fastening the shorter top side sections

- ➤ Remove the film from the short side sections.
- ➤ Slide the short side sections (**➞ Table 5.1/5.3, Item 22/23**) over the collectors at the left and right in the uppermost horizontal row.
- ➤ Take care that the respective side section
  - rests on the collector frame,
  - is pushed together with the lower side section at the fold (**1**). Push the fold on the lower side section apart a little for this.
- ➤ Press the side section on to the side section so that it locks.
- ➤ Fasten the side sections to the roof battens with the supplied brackets (**2**) (**➞ Table 5.1/5.3, Item 31**) and No. **2** screws (**➞ Table 5.2/5.4**) using the Torx bit.

5.5.7 Attaching trapezoidal plates, connectors, ridge sheets and tile supports

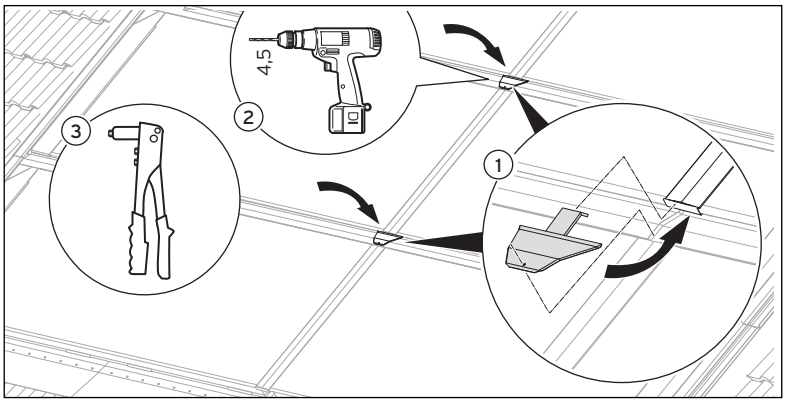

Fig. 5.29 Attaching the ridge plates

The trapezoidal plate (**1**) (**➞ Table 5.1/5.3, Item 27**) covers the area (the "cross") in which the interstices of four collectors meet.

- ➤ Slide a trapezoidal plate with the strap under the vertical intermediate plate (**1**).
- ➤ Slide the trapezoidal plate forward until the bent edges rest on the horizontal intermediate plates.
- ➤ Drill a hole through the opening at the upper end of the trapezoidal plate into the intermediate plates underneath (**2**).
- ➤ Rivet the trapezoidal plate to the intermediate plates (**3**).

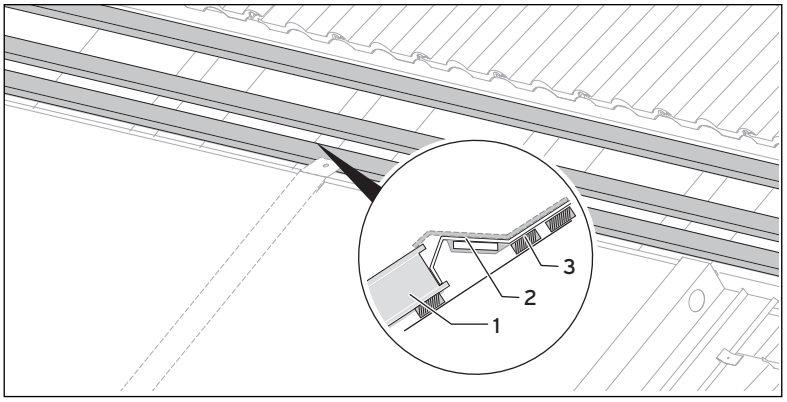

Fig. 5.30 Fitting additional roof battens as required

The space between the uppermost collector (**1**) and the ridge is required for the ridge plate couplers (**2**) on which the ridge plates are then laid. To create a level surface, it may be necessary to fit several roof battens (**3**).

- ➤ Attach a lower ridge plate coupling (**2**) (**→ Table 5.1/5.3, Item 16**) and check for a level surface.
- ➤ Fit one or two additional roof battens (**3**) (**→ Table 5.1/5.3, Item 13**) and check that the drill holes in the ridge plate couplings align with the battens.
- ➤ Lay the ridge plate couplings aside and screw the roof battens down firmly. Make sure when doing this
  - that the roof battens are resting flush against the outer edge of the collector,
  - that the roof battens terminate in the middle of a rafter and abut with the next batten.

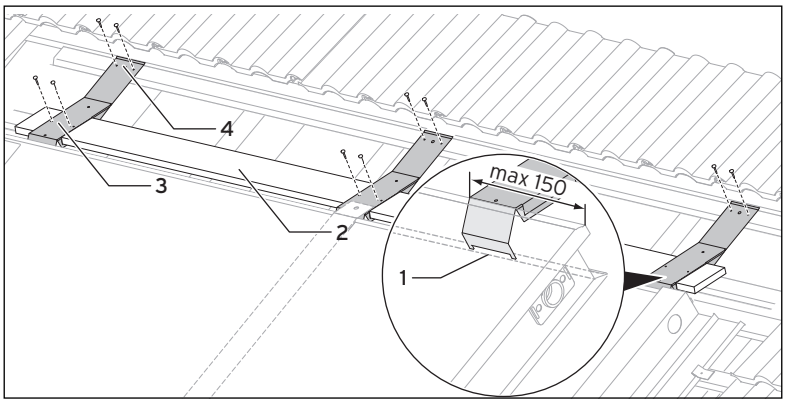

Fig. 5.31 Fitting lower ridge plate couplings (vertical collector)

With vertical collector position

- ➤ Attach the lower ridge plate couplings (**→ Table 5.1/5.3, Item 16**) above the collector:
  - one on the external edge (max. 150 mm from the edge),
  - one per collector joint (central).
- ➤ Make sure that the lower ridge plate couplings are resting on the collector frame slot (**1**).
- ➤ Slide a support board (**→ Table 5.1, Item 18**) through the straps on the lower ridge plate coupling (**2**).
- ➤ Join the lower ridge plate couplings to the support board with two No. **2** screws each (**→ Table 5.2/5.4**) using the Torx bit to prevent it from slipping (**3**).
- ➤ Screw the lower ridge plate coupling at the top to the roof batten (**4**).

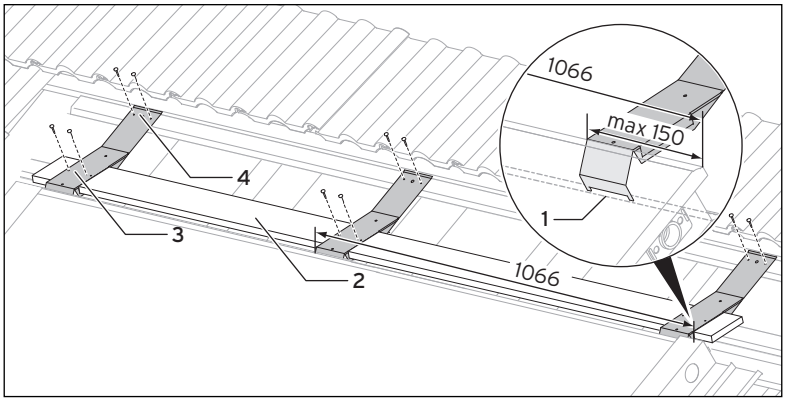

Fig. 5.32 Fitting lower ridge plate couplings (horizontal collector)

With horizontal collector position

- Attach the lower ridge plate couplings (**→ Table 5.1/5.3, Item 16**) above the collector:
  - one on the external edge (max. 150 mm from the edge).
  - in the centre of the collector (1066 mm from the edge).
  - one per collector joint (central).
- Make sure that the lower ridge plate couplings are resting on the collector frame slot (**1**).
- Slide a support board (**→ Table 5.3, Item 18**) through the straps on the lower ridge plate coupling (**2**).
- Join the lower ridge plate couplings to the support board with two No. **2** screws each (**→ Table 5.2/5.4**) using the Torx bit to prevent it from slipping (**3**).
- Screw the lower ridge plate coupling at the top to the roof batten (**4**).

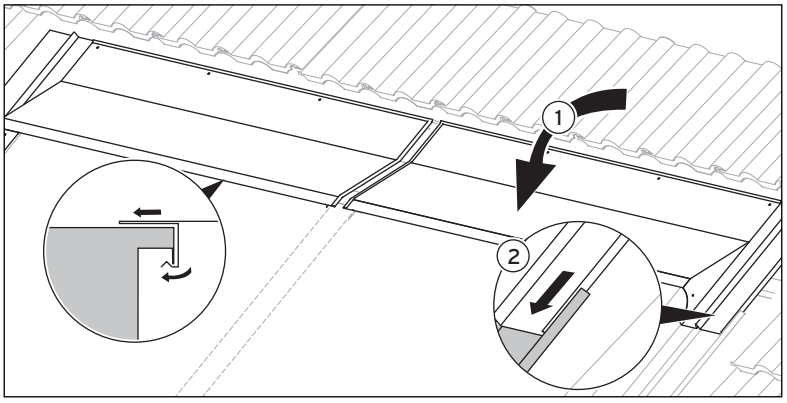

Fig. 5.33 Mounting the ridge plates

- Remove the protective film from the ridge plates (**→ Table 5.1/5.3, Item 14, 15, 10**).
- Slide the ridge plates (**1**) over the lower ridge plate couplings.
- Make sure that the ridge plates are above the side sections and slip into the corresponding rail (**2**).
- Start with a left hand ridge plate (**→ Table 5.1/5.3, Item 14**).
- If there are three or more collectors next to one another, fit the corresponding number of centre ridge plates (**→ Table 5.1/5.3, Item 10**) an.
- To finish, fit the right hand ridge plate (**→ Table 5.1/5.3, Item 15**).

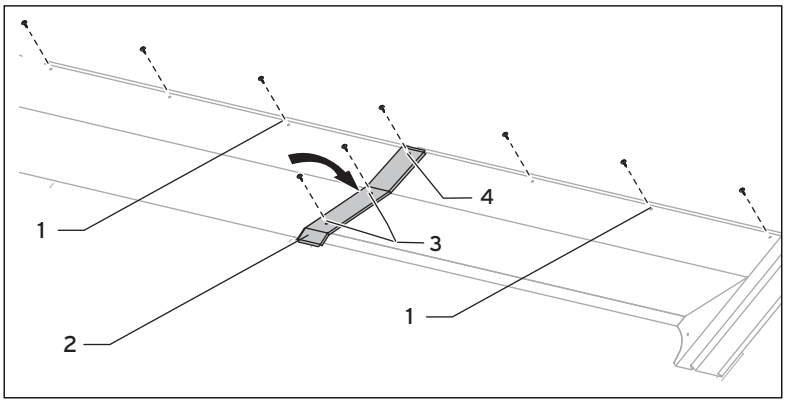

Fig. 5.34 Screwing down the ridge plates and attaching the upper ridge plate couplings

- Fasten all the ridge plates to the roof battens with the No. **1** screws (**→ Table 5.2/5.4**) using the Torx bit (**1**).
- Take the required number of upper ridge plate couplers (**→ Table 5.1/5.3, Item 11**). An upper ridge plate coupling must be screwed between each left hand, centre and right hand ridge plate.
- Fasten all the upper ridge plate couplings (**2**) above the ridge plate joint with two No. **4** screws **(→ Table 5.2/5.4), Item (3) in Fig. 5.34, and one No. 1 screw (→ Table 5.2/5.4), Item (4) in Fig. 5.34**, using the Torx bit.

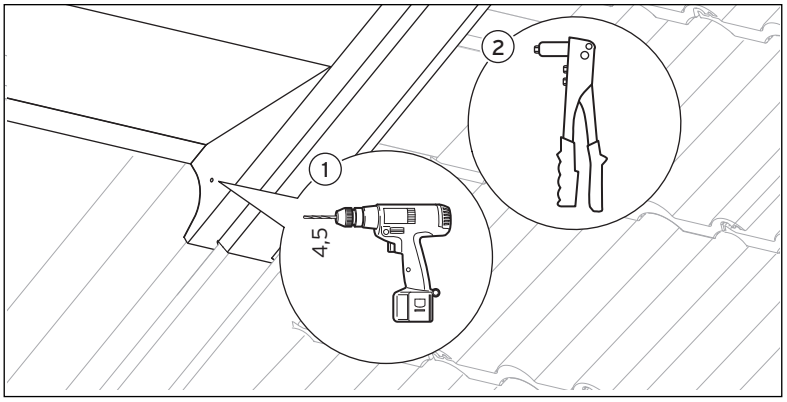

Fig. 5.35 Riveting the frame

- Drill a 4.5 mm diameter hole **through the markings in each of the left and right hand ridge plates** into the side sections (**1**).
- Rivet the ridge plates to the side sections (**2**).

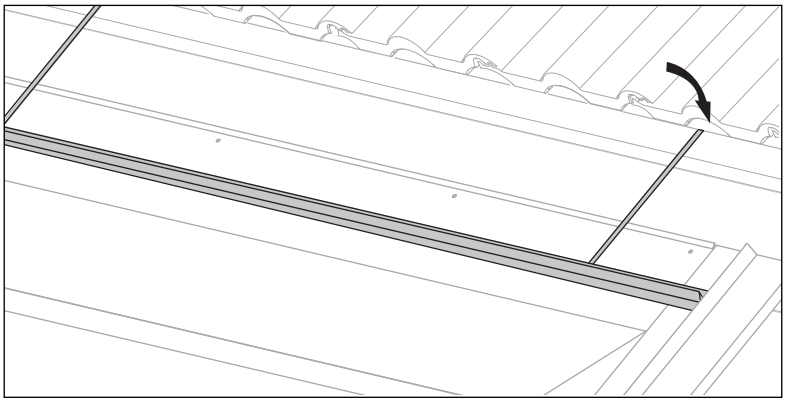

Fig. 5.36 Covering the profile ends with tile supports

- Lay the tile supports (**→ Table 5.1/5.3, Item 12**) on the ridge plates.
- Bend the metal bands and hook the tile bars to the roof batten above.

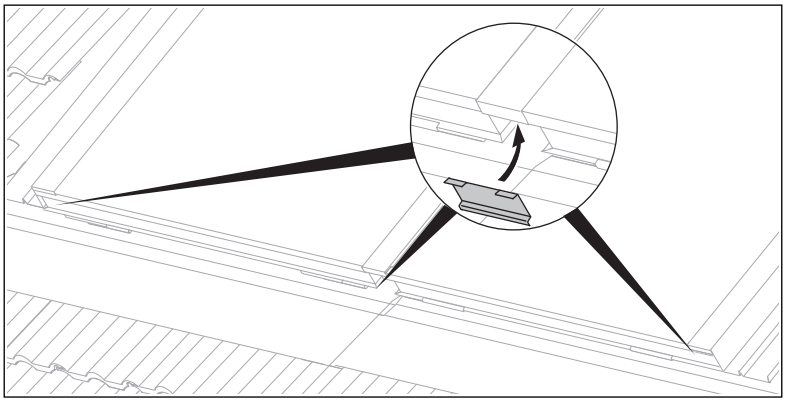

Fig. 5.37 Fitting the end caps

- Cover the side profile ends and the collector joints from below with the end caps (**→ Table 5.1/5.3, Item 32**).
- To do this, attach the end caps at the bottom.
- Then tilt the end caps upwards until they can be felt engaging on the upper edge of the collectors.

5.5.8 Re-covering the roof

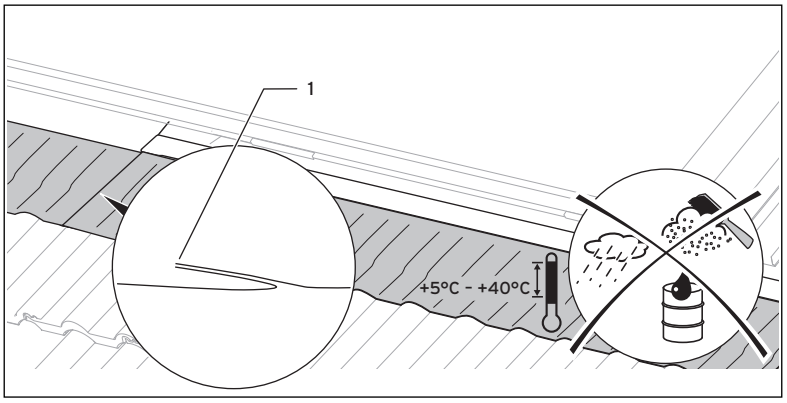

Fig. 5.38 Adapting the flexible apron

- Remove the protective film from the adhesive surface of the flexible apron (→ **Table 5.1/5.3, Item 17**).
- Adapt the flexible apron to the shape of the tiles.
- Stick the flexible apron where parts overlap (**1**).

Make sure that the adhesive surface is dry and free from dust and grease.

- As required, (e.g. with high roof tiles) stick the sealing apron extension under the flexible apron. Pay attention to the direction the rain water flows in when doing this.

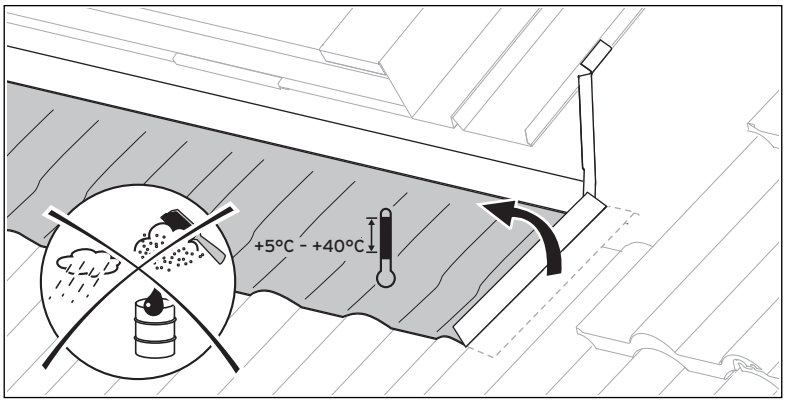

Fig. 5.39 Sticking the flexible protection

- Turn the flexible aprons back at the ends of the collector array.

Make sure that the adhesive surface is dry and free from dust and grease.

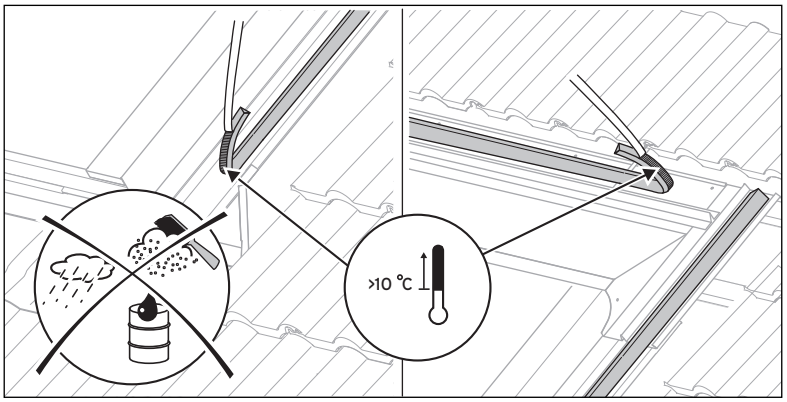

Fig. 5.40 Mounting the foam sealing wedge

- Stick the foam sealing wedge on the side sections of the collector frame.
- Stick the foam wedge to the ridge plates.
- If necessary carefully cut the foam sealing wedge with the utility knife.

Make sure that the adhesive surface is dry and free from dust and grease.

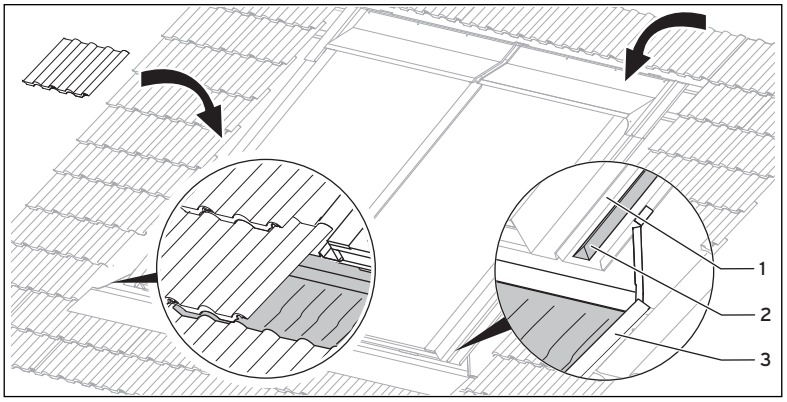

Fig. 5.41 Covering the roof

- ➤ Close the free spaces between collector and pantiles.
- ➤ Make sure that the pantiles at the side of the collector array
  - meet the central web (**1**) of the side sections,
  - are positioned close over the foam sealing wedge (**2**),
  - are stuck to the adhesive surfaces (**3**) of the flexible apron.
- ➤ For dimensions please see Table 5.5.
- ➤ For this purpose use the removed tiles and adapt them if necessary.

5.6 Checklist

Based on the following table, make sure all work steps have been performed.

	Step	
1	All connections fixed with safety clips	
2	Hydraulic connections laid correctly	
3	Collector sensor connected	
4	Collectors connected to lightning protection device	
5	Pressure test carried out, all connections tight	
6	Intact insulation	

Table 5.6 Checklist

After commissioning and in seasons when wide outside temperature fluctuations occur, condensate can form in the collector. This is normal.

Reflections caused by irregularities in the glass are typical of the material.

6 De-commissioning

➤ Even when taking out of service and disassembling, observe the
- Transport and handling instructions (➙ **Chap. 3.1**),
- Assembly instructions (➙ **Chap. 3.2**),
- Good engineering practice (➙ **Chap. 3.3**) and
- Accident prevention regulations (➙ **Chap. 3.4**).

Danger!
Danger of burning and scalding!
When exposed to solar irradiation, the inside of the collectors can reach 200 °C.
➤ Avoid working in direct sunlight.
➤ Cover the flat collectors before starting work.
➤ Preferably work during the morning.
➤ Wear suitable protective gloves.
➤ Wear suitable safety glasses.

The solar energy system should not be taken out of service. The solar energy system can be taken out of service for a short time for repairs or maintenance work.

Caution!
Risk of damaging the flat collectors!
Flat collectors that are not in operation can age prematurely as a result of long-term high standstill temperatures.
➤ Make sure that only a competent person takes the solar energy system out of service.
➤ Take the flat collectors out of service for a maximum of four weeks.
➤ Cover the flat collectors that are not in use.
➤ Make sure that the cover is securely fastened.
➤ Remove the flat collectors if you shut the solar system down for longer periods.

Caution!
Risk of oxidising the solar fluid!
If the solar circuit is opened during a long period out of service, the solar fluid can age prematurely as a result of the ingress of atmospheric oxygen.
➤ Make sure that only a competent person takes the solar energy system out of service.
➤ Take the flat collectors out of service for a maximum of four weeks.
➤ Drain the entire system before a long period out of service and dispose of the solar fluid professionally.
➤ Remove the flat collectors if you shut the solar system down for longer periods.

6.1 Removing the flat collectors

Caution!
Damage to the flat collector and the solar system!
Incorrect removal can cause damage to the flat collector and the solar system.
➤ Before the flat collectors are removed, make sure that only a qualified heating engineer or Vaillant customer service technician takes the solar system out of service.

Caution!
Environmental hazard caused by solar fluid!
After the solar system has been taken out of service, the flat collectors are still filled with solar fluid which can escape during removal.
➤ During transport from the roof, close off the pipe connections on the flat collector with cover plugs.

➤ Unfasten the hydraulic connections.
➤ Unfasten the brackets.
➤ Take the flat collector from the roof.
➤ Remove the cover plugs.
➤ Completely drain the flat collector into a canister via both of the lower connections.
➤ Insert the cover plugs again.
➤ Deliver the solar fluid to a proper disposal facility (➙ **Chap. 7.3**).
➤ Pack the flat collectors adequately.
➤ Deliver the flat collectors to a proper disposal facility (➙ **Chap. 7.1**).

7 Recycling and disposal

Both the appliance and its transport packaging are made predominantly of recyclable raw materials. Please observe the applicable national legal regulations.

7.1 Collectors

All Vaillant GmbH solar collectors comply with the requirements of the German environmental label "Blue Angel". Therefore, we, as the manufacturer, will take back and recycle components when they have to be disposed of after years of reliable use.

7.2 Packaging

The heating engineer who installed the equipment is responsible for disposing of the transport packaging.

7.3 Solar fluid

The solar fluid must be disposed of at an appropriate waste site or waste incineration plant, for example, in compliance with local regulations.
Uncontaminated packaging can be reused. Dispose of packaging that cannot be cleaned in the same way as for solar fluid.

8 Warranty and customer service

8.1 Vaillant warranty

Vaillant provides a full parts and labour warranty for this appliance.
The appliance and all associated pipe work and controls must be installed by suitably competent persons in accordance with all current and relevant safety, building control and planning regulations and in full compliance with the manufacturer's instructions.
All unvented domestic hot water cylinders must be installed by a competent person to the prevailing building regulations at the time of installation (G3).
Terms and conditions apply to the warranty, details of which can be found on the warranty registration card included with this appliance.
Failure to install and commission this appliance in compliance with the manufacturer's instructions may invalidate the warranty (this does not affect the customer's statutory rights).

8.2 Vaillant Service

To ensure regular servicing, it is strongly recommended that arrangements are made for a Maintenance Agreement. Please contact Vaillant Service Solutions (0870 6060 777) for further details.

9 Technical Data

	Unit	VFK 145/2 H/V	VFK 155 H/V
Absorber type		Serpentine horiz./vert.	
Dimensions (L x W x H)	mm	2033 x 1233 x 80 (V)	2033 x 1233 x 80 (V)
		1233 x 2033 x 80 (H)	1233 x 2033 x 80 (H)
Weight	kg	38	
Volume	l	2.16 (H) 1.85 (V)	
Max. pressure	bar	10	
Stagnation temperature	°C	199	172
Gross area	m^2	2.51	
Aperture surface area	m^2	2.35	
Absorber surface area	m^2	2.33	
Absorber	mm	Aluminium (vacuum coated) 0.5 x 1178 x 1978	
Coating		High selective (blue)	
		α = 95 % ε = 5 %	
Glass covering	mm	3.2 (thickness) x 1233 x 2033	
Glass type		Solar safety glass (prismatic structure)	Solar safety glass (anti-reflection coating)
Transmission	%	τ = 91	τ = 96
Back wall insulation	mm W/m^2K kg/m^3	40 λ = 0.035 ρ = 55	
Edge insulation		none	available
Efficiency ηo	%	80.1 (H) 79.1 (V)	84.2 (H) 83.3 (V)
Heat loss factor (k_1)	W/m^2K	3.32 (H) 2.41 (V)	3.82 (H) 2.33 (V)
Heat loss factor (k_2)	W/m^2K^2	0.023 (H) 0.049 (V)	0.018 (H) 0.049 (V)

Table 9.1 Technical data

VFK 145/2 V, VFK 155 V

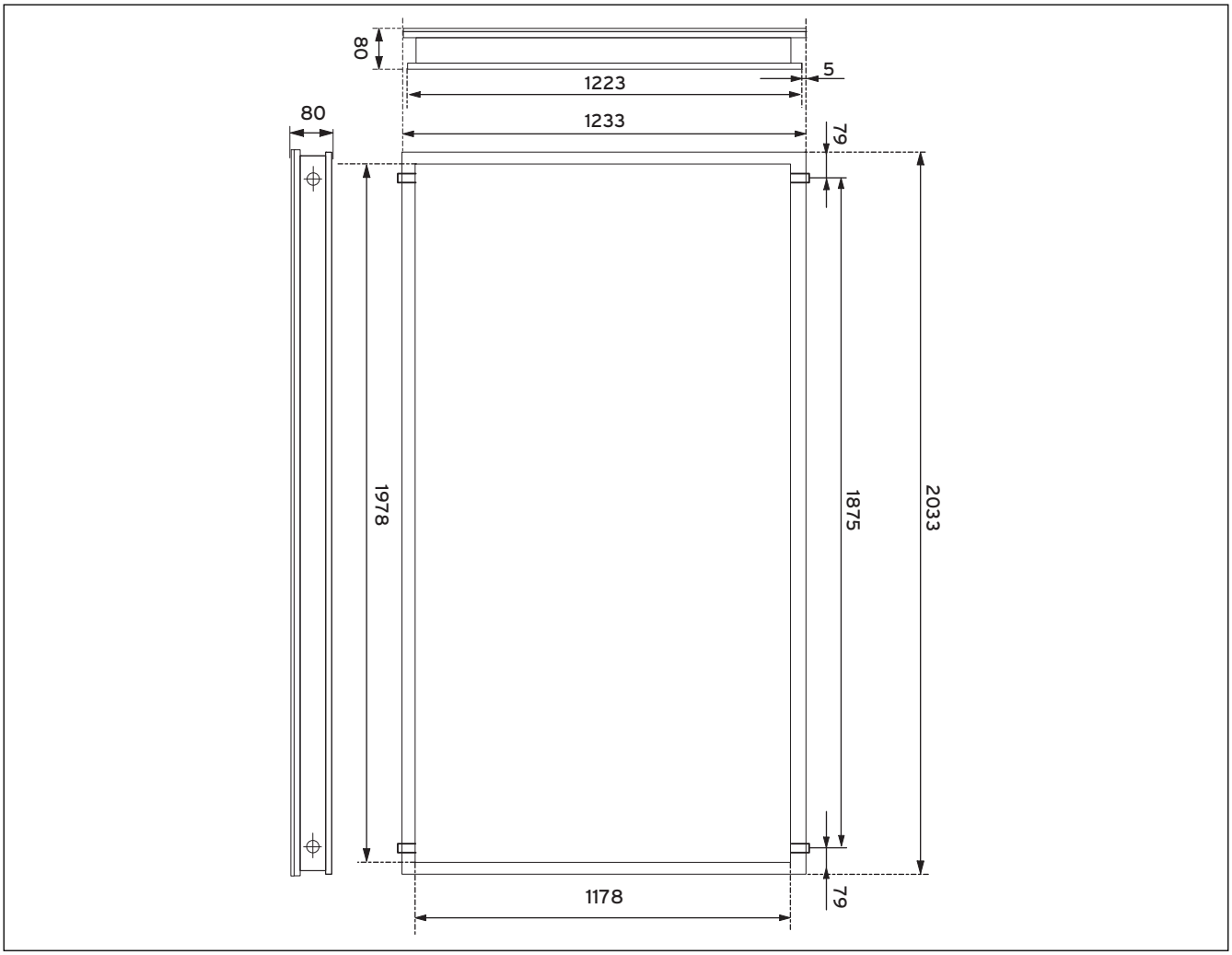

Fig. 9.1 Dimensional drawing VFK 145/2 V, VFK 155 V

VFK 145/2 H, VFK 155 H

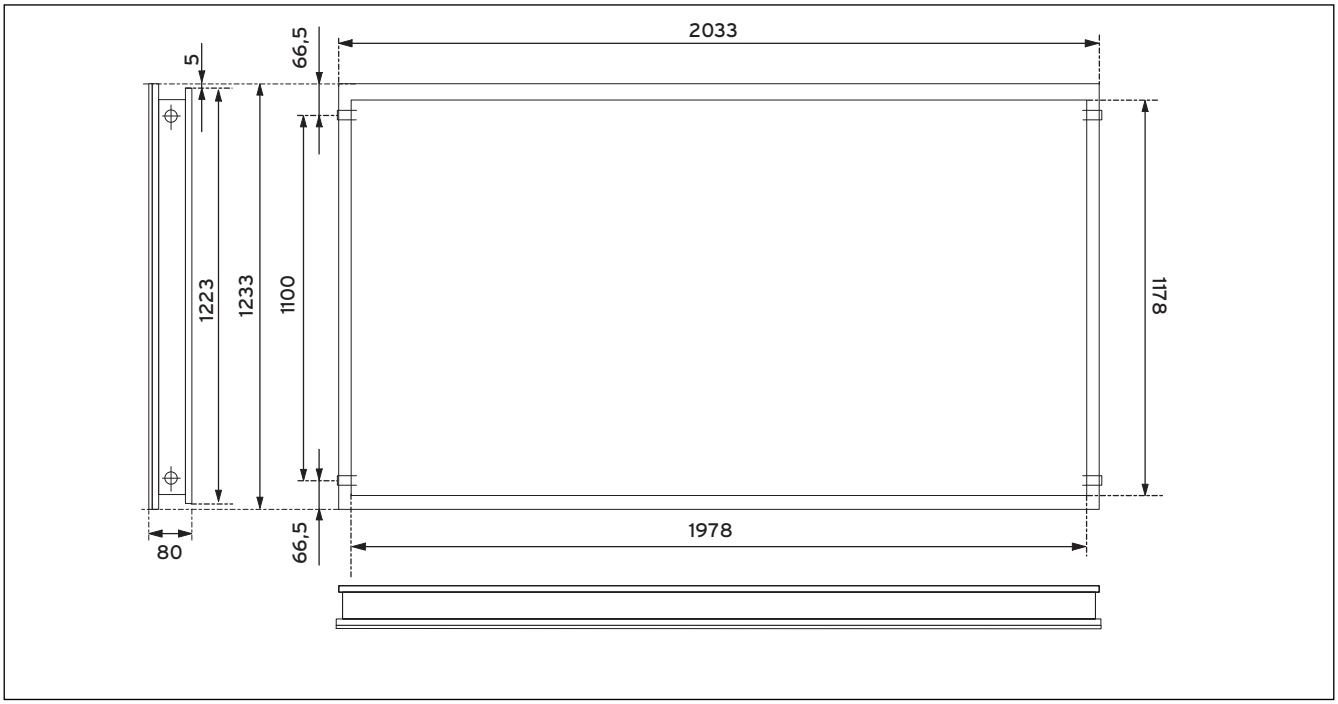

Fig. 9.2 Dimensional drawing VFK 145/2 H, VFK 155 H

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